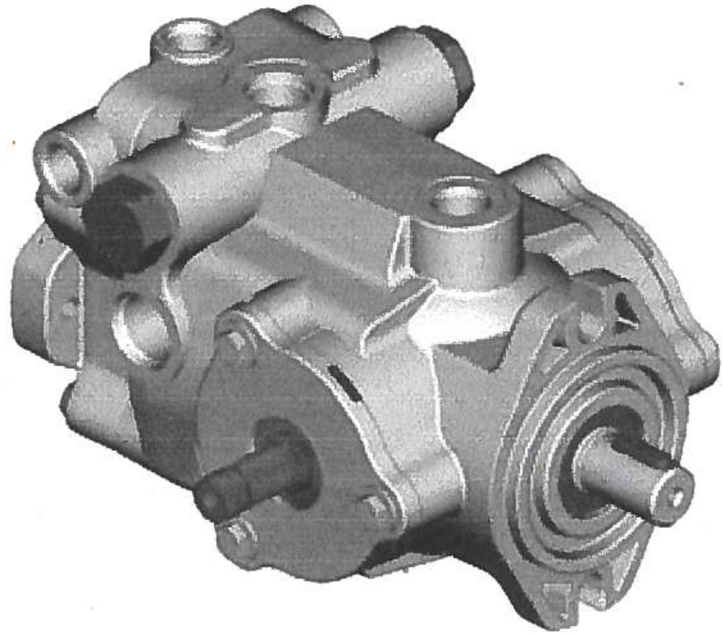
CATALOG #05 CAT/905

Eaton®
Medium Duty Piston Pump

No. 06-06-638
EN-0300
(Replaces 06-638)

EATON

Parts Information



Model 70160 Variable Displacement Piston Pump
20,3 cm³/r [1.24 in³/r] or 23,6 cm³/r [1.44 in³/r] Displacements
Manual Controlled

v-02

Identification Numbers - Manually Variable Displacement Piston Pump

Stamped on each unit's mounting flange.

A - Product Number Description
  70160 = Single Piston Pump
  78162 = Single Piston Pump with Gear Pump
  78161 = Tandem Piston Pumps
  78163 = Tandem Piston Pumps with Gear Pump
B - Sequential Numbering
C - Engineering Design Code

Single Pump - Product Number:

70160 - RAA - 02
A = 70160
B = RAA
C = 02

Tandem Pumps - Product Number:

78163 - RAB - 02
A = 78163
B = RAB
C = 02

Serial Number Code:

A 98 01 31 JB

A - Revision level of parts list.
98 - Last two digits of year built. (98 for 1998 etc.)
01 - Month (two digits)
31 - Day of Month (two digits)
JB - Tester's Initials

Each order must include the following information.

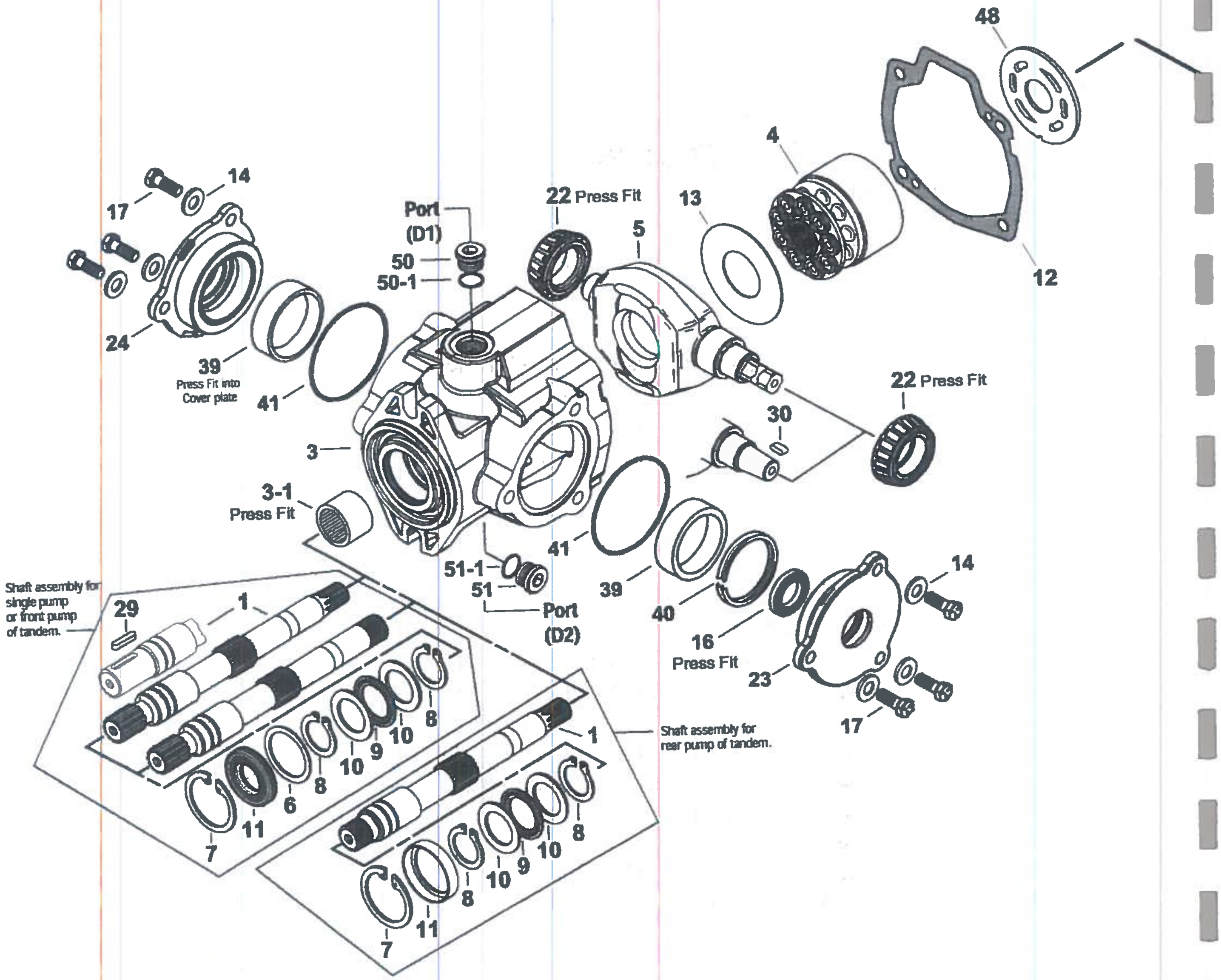
1. Product and/or Part Number
2. Serial Number Code
3. Part Name
4. Quantity

Tools Required

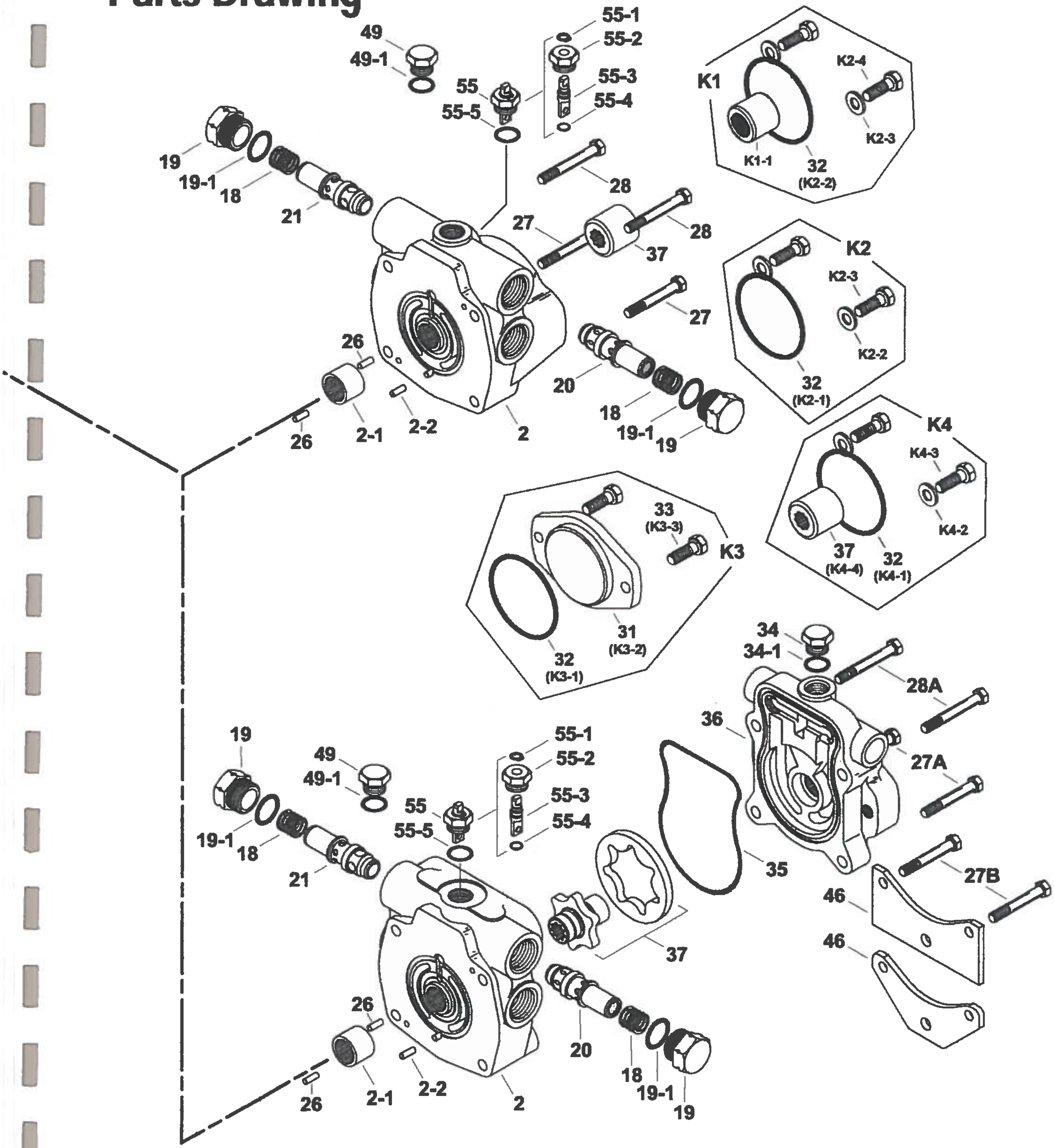
- 1/2, 9/16, 7/8 & 1-1/8 in. sockets and/or end wrenches
- Torque wrench (136 N·m [100 lbf·ft] capacity)
- Ratchet wrench
- 5/16 in. and 7/16 Allen wrenches or bit sockets
- Internal and external retaining ring pliers
- Small screwdrivers (2)
- Hammer (soft face)
- Light Petroleum Jelly
- Seal driver or similar tool

Parts Drawing

Pump drawn below is typical of a right hand pump.



Parts Drawing



Parts List

Parts listed below are to service catalog units. Other variations of units are built that have parts altered for special requirements. The non-catalog units can be serviced with the parts list below using caution for proper identification. Contact an Eaton representative with any questions concerning your selection. Have your final assembly number ready when contacting representative.

Item	02 Part No.	Qty.	Description
1	◆	1	Drive Shaft (Identification drawing on page #8)
2	◆	1	Endcover Assembly (Identification drawing and parts list on page #9)
3	◆	1	Housing Assembly (Identification drawing on page #10)
3-1	16238-11616	1	Bearing (Press Fit)
4	70111-692	1	Rotating Kit Assembly (parts list on page #10)
5		1	Swashplate, 20,3 cm^3/r [1.24 in^3/r] Displacement
	70160-623		Square Arm
	70160-617		Tapered Arm
5		1	Swashplate, 23,6 cm^3/r [1.44 in^3/r] Displacement
	70160-620		Square Arm
	70160-618		Tapered Arm
6	16048-312	1	Washer
+ 7	16077-26	1	Retaining Ring
+ 8	16078-16	2	Retaining Ring
9	16241-1625	1	Thrust Bearing
10	16241-C1625	2	Bearing Race
+ 11	16253-16	1	Shaft Seal, Drive
11	16253-216	1	Viton Shaft Seal, Drive
11	70102-636	1	Spacer
+ 12	70111-701	1	Housing Gasket
13	70160-504	1	Swashplate Insert
14	106013-038	6	Washer
+ 16	16253-214	1	Shaft Seal, Trunnion
17	16136-610	6	Screw, Cap
18	17086-017	2	Spring
19	32060-8	2	Plug Assembly
+ 19-1	16015-18-90	2	O-ring, 2,38 mm Dia. x 22,23 mm ID. [.0937 in. Dia. x .875 in. ID.]
20	◆	1	Relief Valve for Port "C" (Identification drawing on page #11)
21	◆	1	Relief Valve for Port "D" (Identification drawing on page #11)
22	16320-117	2	Cone Bearing
23	70160-508	1	Cover Plate
24	70160-510	1	Cover Plate
26	16028-304	2	Dowel Pin
27	16136-520	2	Cap Screws, 5/16-18, 50,8 mm [2 in.] Long
27A	16136-532	2	Cap Screws, 5/16-18, 82,6 mm [3.25 in.] Long
27B	16136-534	2	Cap Screws, 5/16-18, 88,9 mm [3.5 in.] Long
28	16136-524	2	Cap Screws, 5/16-18, 63,5 mm [2.5 in.] Long
28A	16136-536	2	Cap Screws, 5/16-18, 95,3 mm [3.75 in.] Long
28B	16136-540	2	Cap Screws, 5/16-18, 101,6 mm [4.00 in.] Long
29		1	Key, Drive Shaft
	24500-619		Used with 7/8 in. dia. drive shaft.
30	16246-430	1	Key, Tapered Arm
31	70142-600	1	Cover Plate (In K3 kit)
+ 32	16007-14	1	O-ring (In K1, K2, K3, & K4 kit)
33	16036-610	2	Cap Screws, Cover Plate (In K3 kit)
34	16103-108	1	Plug Assembly
+ 34-1	16133-8	1	O-ring, 2,21 mm Dia. x 16,36 mm ID. [.087 in. Dia. x .644 in. ID.]
+ 35	70111-703	1	Molded O-ring
36	◆	1	Charge Pump Adaptor (Identification drawing and parts list on page #12 & #13)
37		1	Gerotor set and coupler sub-assembly
	70111-642		6,9 cm^3/r [.42 in^3/r] displacement, 6,35 mm [.25 in] width
	70111-646		13,8 cm^3/r [.84 in^3/r] displacement, 12,7 mm [.5 in] width

Parts List

Item	02 Part No.	Qty.	Description
37	70111-667	1	9 tooth coupler (In Kit 4)
37	70111-687	1	11 tooth coupler (In Kit 5)
39	16321-117	2	Cup, Bearing
40	N/S	1	Ring, Crush (Shim kit must be ordered to replace crush ring).
41	16015-46	2	O-ring, 2.38 mm Dia. x 66.68 mm I.D. [.0937 in. Dia. x 2.625 in. I.D.]
42	106013-031	4	Washer
46	70111-632	1	Mounting Bracket, Square shaped
46	70111-709	1	Mounting Bracket, "V" shaped
48	◆	1	Valve Plate (Identification drawing on page #11)
	70113-008		Righthand (CW) Rotation
	70113-009		Lefthand (CCW) Rotation
+ 49	16103-108	1	Plug Assembly
49-1	16133-8	1	O-ring, 2,21 mm Dia. x 16,36 mm I.D. [.087 in. Dia. x .644 in. I.D.]
50	16103-308	1	Plug Assembly
+ 50-1	16133-8	1	O-ring, 2,21 mm Dia. x 16,36 mm I.D. [.087 in. Dia. x .644 in. I.D.]
51	16103-308	1	Plug Assembly
+ 51-1	16133-8	1	O-ring, 1,98 mm Dia. x 11,89 mm ID. [.078 in. Dia. x .468 in. ID.]
55	70300-610	1	Bypass Valve sub-assembly
+ 55-1	16078-6	1	Retaining Ring
55-2	70300-609	1	Separator Plug
55-3	70411-502	1	Separator
+ 55-4	16003-7	1	O-ring, 1,59 mm Dia. x 9,53 mm I.D. [.0625 in. Dia. x .375 in. I.D.]
+ 55-5	16133-8	1	O-ring, 2,21 mm Dia. x 16,36 mm I.D. [.087 in. Dia. x .644 in. I.D.]

Mounting Kits

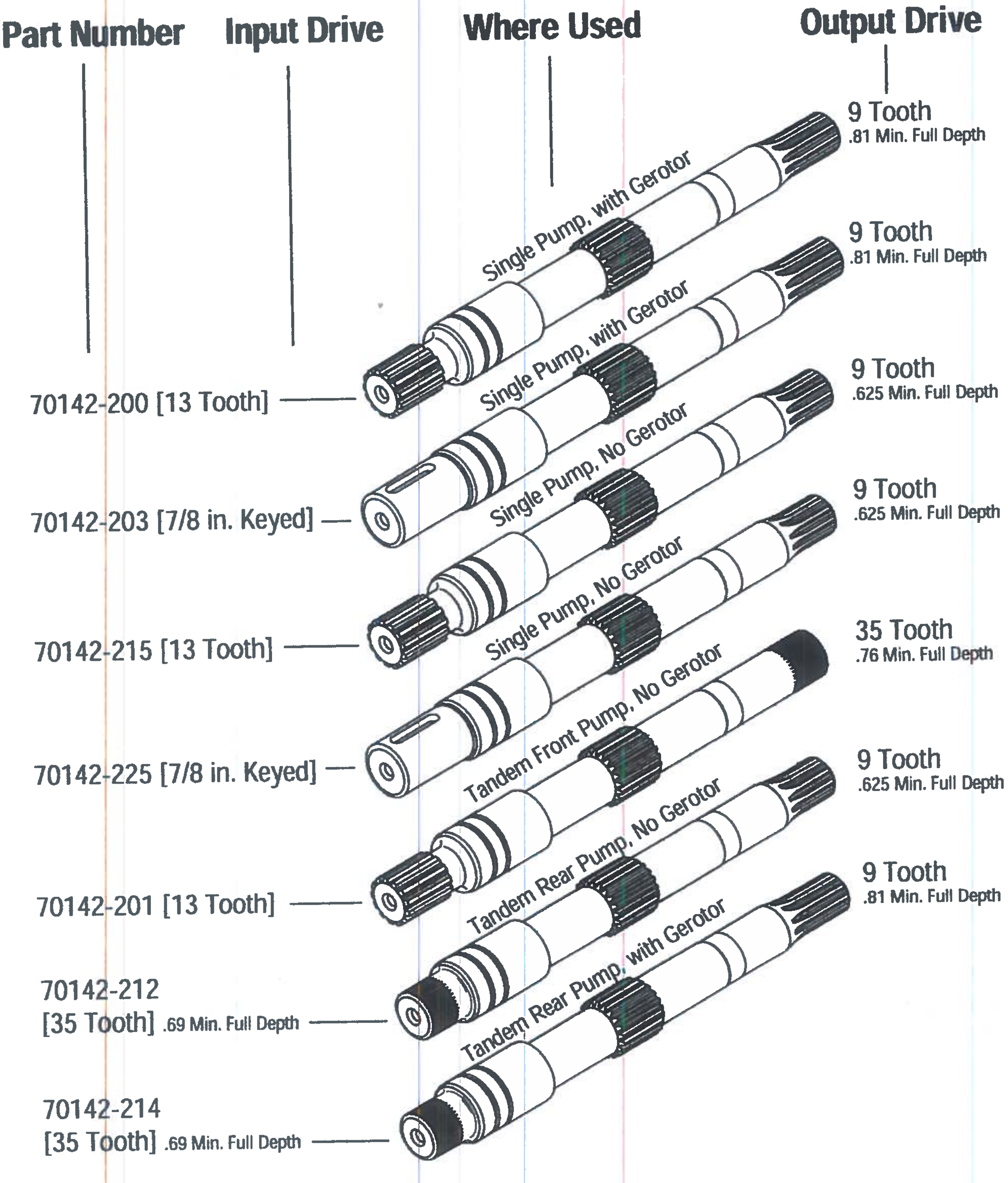
K1	70142-944	1	Tandem Piston Pump Mounting Kit
K1-1	70111-666	1	35T Coupler, 36,8 mm [1.45 in.] long
K1-2	16007-14	1	O-ring, 1,59 mm Dia. x 101,6 mm ID. [.0625 in. Dia. x 4 in. ID.]
K1-3	16136-613	2	Cap Screws
K1-4	16048-8	2	Washer
K2	70442-929	1	Gear Pump Mounting Kit
K2-1	16007-14	1	O-ring, 1,59 mm Dia. x 82,55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K2-2	16048-113	2	Washer
K2-3	16136-612	2	Cap Screws
K3	70142-915	1	Cover Plate Kit
K3-1	16007-14	1	O-ring, 1,59 mm Dia. x 82,55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K3-2	70142-600	1	Cover Plate
K3-3	16136-610	2	Cap Screws
K4	70144-903	1	Gear Pump Mounting Kit with Coupler
K4-1	16007-14	1	O-ring, 1,59 mm Dia. x 101,6 mm ID. [.0625 in. Dia. x 4 in. ID.]
K4-2	16048-113	2	Washer
K4-3	16136-612	2	Cap Screws
K4-4	70111-667	1	9T Coupler

Seal Repair Kit

70160-902	1	Seal Repair Kit for 70160 piston pump.
70160-903	1	Control Shaft Shim Kit (to replace crush ring (40) after replacment of cover plate).

Legend		
	◆	Refer to specific item parts list.
	+	Common parts to seal repair kits.
	N/S	Not Serviceable

Item 1 - Drive Shaft Identification

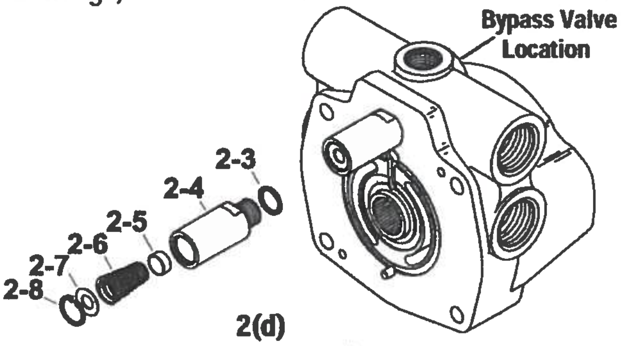


Item 2 -

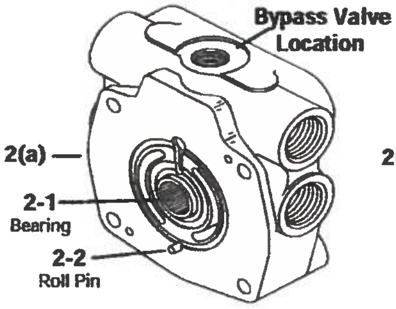
Endcover Assembly Identification

Item 2 - Parts List (Refer to Identification chart and drawings)

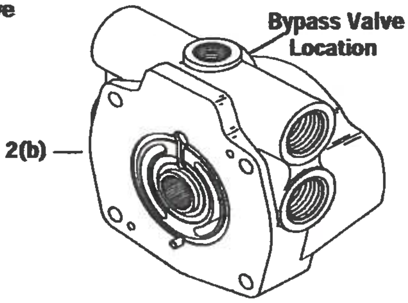
Item	Part Number	Qty.	Description
2	See chart below		Endcover Assembly
2-1	70420-43	1	Bearing
2-2	16026-610	1	Roll Pin
2-3	16133-6	1	O-ring
2-4	70111-711	1	Charge Relief Housing
2-5	70111-507	1	Poppet Filter Relief
2-6	17000-48B	1	Spring (100-150 PSI)
2-7	16048-260	1	Washer
2-8	16077-10	1	Retaining Ring
2-9	70400-508	1	Bleed-off Valve Poppet
2-10	17023-12	1	Spring
2-11	16133-5	1	O-ring
2-12	70400-501	1	Cartridge



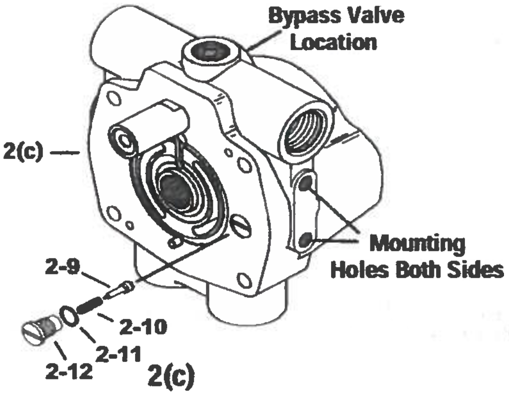
2(d)
Rear "A" Mount, Opposite Side Porting with Charge Relief



2(a)
Accepts Gerotor Charge Pump



2(b)
Rear "A" Mount, Opposite Side Porting



2(c)
Rear "A" Mount, Same Side Porting with Mounting Holes

Item 2 - Endcover Assembly Identification (Refer to drawings above)

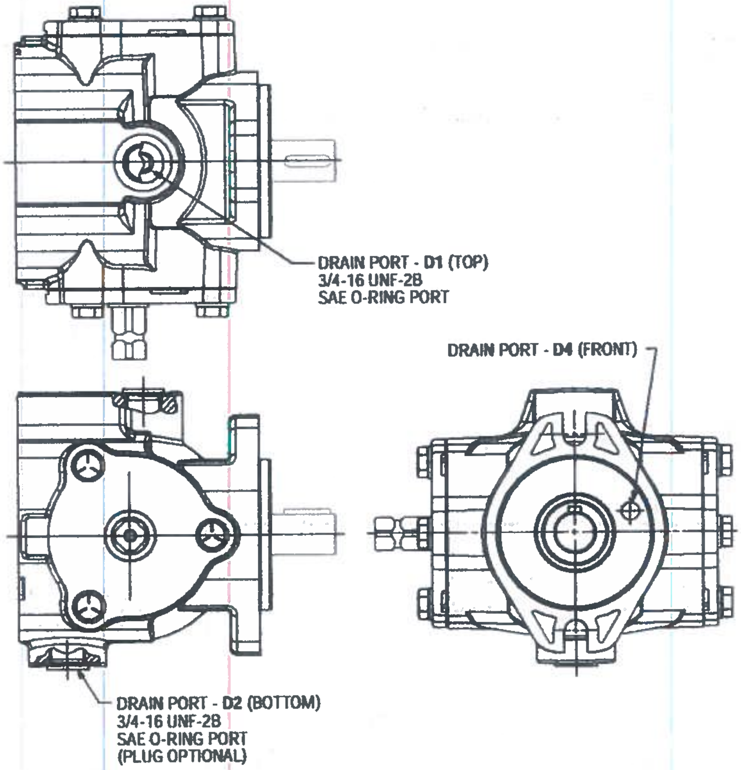
Item	Part Number	Charge Pump	Main Port	Bypass Valve	Charge Relief to Case	Charge Relief Setting bar [PSI]	Special Feature
2(a)	70119-005	Yes	Opposite Sides*	Yes	No	----	----
2(b)	70117-021	No	Opposite Sides*	Yes	No	----	----
2(c)	70121-022	No	Same Side*	Yes	Yes	6,89-10,34 [100-150]	Bleed Off & Mounting Holes
2(d)	70117-023	No	Opposite Sides*	Yes	Yes	6,89-10,34 [100-150]	----

* Port Size: 1 1/16-12 UN-2B

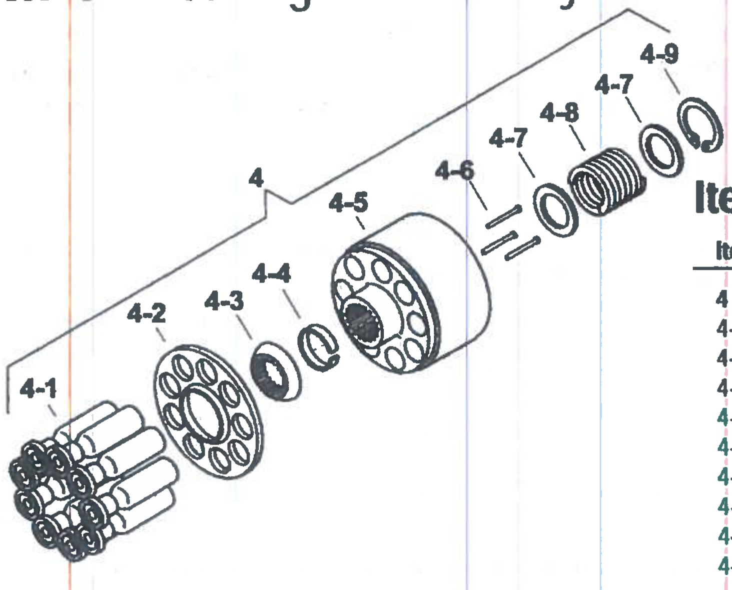
Item 3 - Housing Assembly Identification

Item 3 - Housing Assembly Identification

Item	Part Number	Port Machined
3	70160-307	D1 & D2
3	113077-001	D1, D2, & D4



Item 4 - Rotating Kit Assembly



Item 4 - Rotating Kit Assembly

Item	Part Number	Qty.	Description
4	70111-692	1	Rotating Kit Assy.
4-1	NSS	9	Piston Assembly
4-2	NSS	1	Shoe Retainer
4-3	NSS	1	Shoe Retainer Pivot
4-4	NSS	1	Pin retainer
4-5	NSS	1	Cylinder Barrel
4-6	NSS	3	Pins
4-7	NSS	2	Washer
4-8	NSS	1	Spring
4-9	NSS	1	Retaining Ring

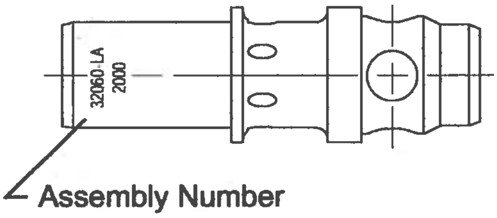
NSS - Not Sold Separately

Item 20 or 21 - Relief Valve

Item 20 or 21 -

Internal Relief Valve Settings Available

Part Number	bar [PSI]
32060-**LA**	138 [2000]
32060-**QA**	172 [2500]
32060-**UA**	207 [3000]
32060-**WA**	241 [3500]
32060-**ZA**	276 [4000]
32060-**XA**	310 [4500]
32060-**IA**	345 [5000]
70111-518	Seat, Valve



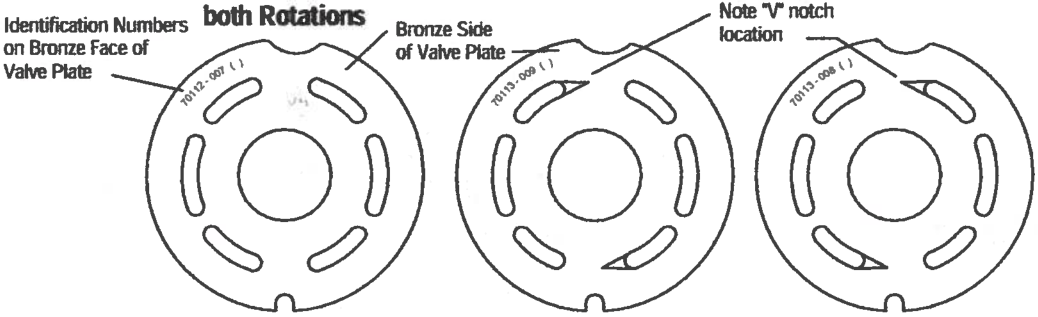
Assembly Number and Pressure Setting

Item 48 - Valve Plate

Low Cam Effort Valving both Rotations

Lefthand Rotation

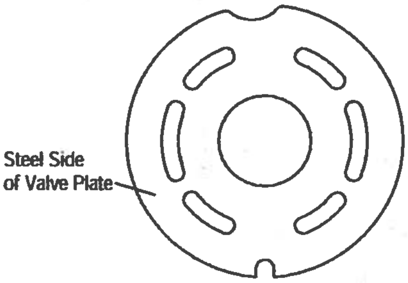
Righthand Rotation



Identification Numbers on Bronze Face of Valve Plate

Bronze Side of Valve Plate

Note "V" notch location



Steel Side of Valve Plate

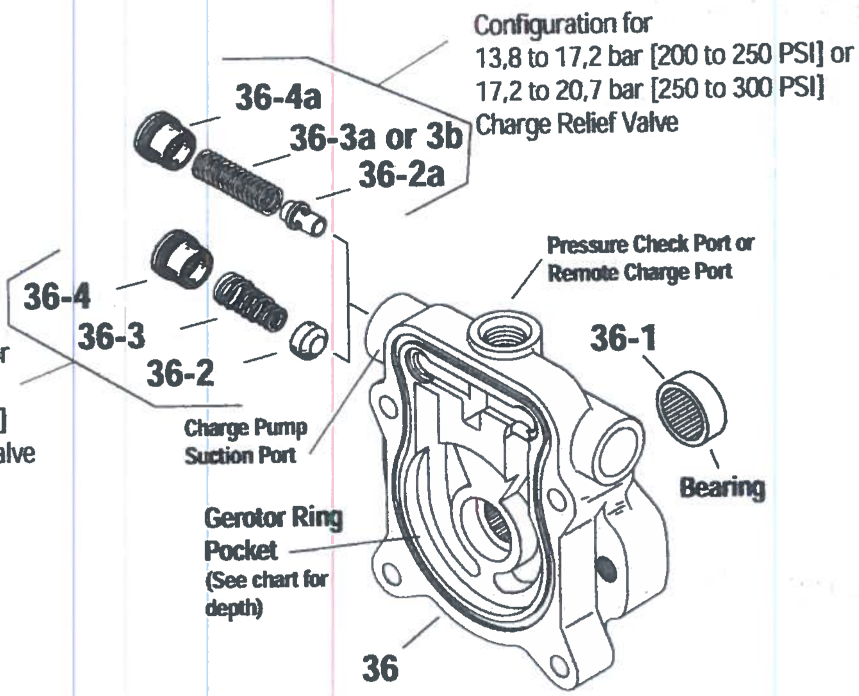
Back Side

No Grooves

Item 36 -

Charge Pump Adapter Assembly Identification

Right Hand Rotation

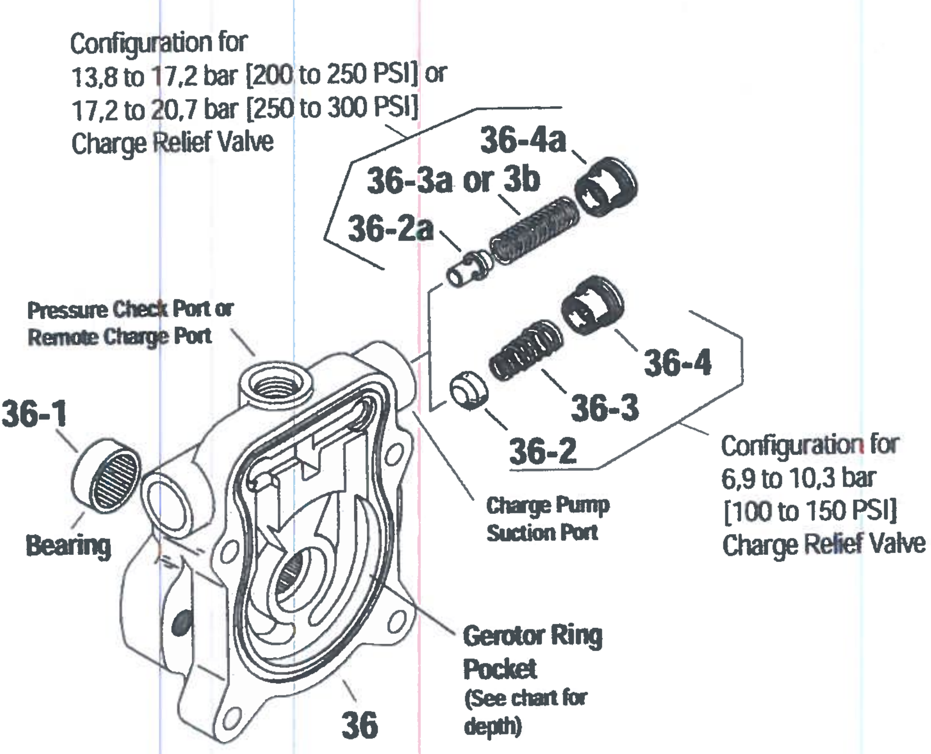


Configuration for
6,9 to 10,3 bar
[100 to 150 PSI]
Charge Relief Valve

Gerotor Pocket Depth

Displacement cm³/r [in³/r]	Depth of Pocket mm [in]
6,9 [.42]	6,35 [.25]
13,8 [.84	12,7 [.50]

Left Hand Rotation



Item 36 -

Charge Pump Adapter Assembly

6,9 to 10,3 bar [100 to 150 PSI] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
36	70142-314	1	Assembly, Charge Pump Adapter	Righthand	6,88 cm^3/r [.42 in^3/r]
	70142-306	1	Assembly, Charge Pump Adapter	Lefthand	13,8 cm^3/r [.84 in^3/r]
	70141-397	1	Assembly, Charge Pump Adapter	Righthand	13,8 cm^3/r [.84 in^3/r]
	70142-359	1	Assembly, Charge Pump Adapter	Lefthand	6,88 cm^3/r [.42 in^3/r]
36-1	16239-1148	1	Bearing (press fit)		
36-2	70111-507	1	Poppet, Cup		
36-3	17000-48B	1	Spring, Tapered		
36-4	70400-505	1	Spring Retainer		

13,8 to 17,2 bar [200 to 250 PSI] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
36	70142-373	1	Assembly, Charge Pump Adapter	Lefthand	6,88 cm^3/r [.42 in^3/r]
	70142-377	1	Assembly, Charge Pump Adapter	Righthand	6,88 cm^3/r [.42 in^3/r]
	70142-380	1	Assembly, Charge Pump Adapter	Righthand	13,8 cm^3/r [.84 in^3/r]
	70142-385	1	Assembly, Charge Pump Adapter	Lefthand	13,8 cm^3/r [.84 in^3/r]
36-1	16239-1148	1	Bearing (press fit)		
36-2a	70400-685	1	Poppet, Pin		
36-3a	17056-40	1	Spring, Color "Light Green"		
36-4a	70400-512	1	Spring Retainer		

17,2 to 20,7 bar [250 to 300 PSI] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
36	70142-376	1	Assembly, Charge Pump Adapter	Righthand	6,88 cm^3/r [.42 in^3/r]
	70142-381	1	Assembly, Charge Pump Adapter	Lefthand	6,88 cm^3/r [.42 in^3/r]
	70142-386	1	Assembly, Charge Pump Adapter	Lefthand	13,8 cm^3/r [.84 in^3/r]
36-1	16239-1148	1	Bearing (press fit)		
36-2a	70400-685	1	Poppet, Pin		
36-3b	17056-41	1	Spring, Color "Pink"		
36-4a	70400-512	1	Spring Retainer		

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EATON

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EN-0300

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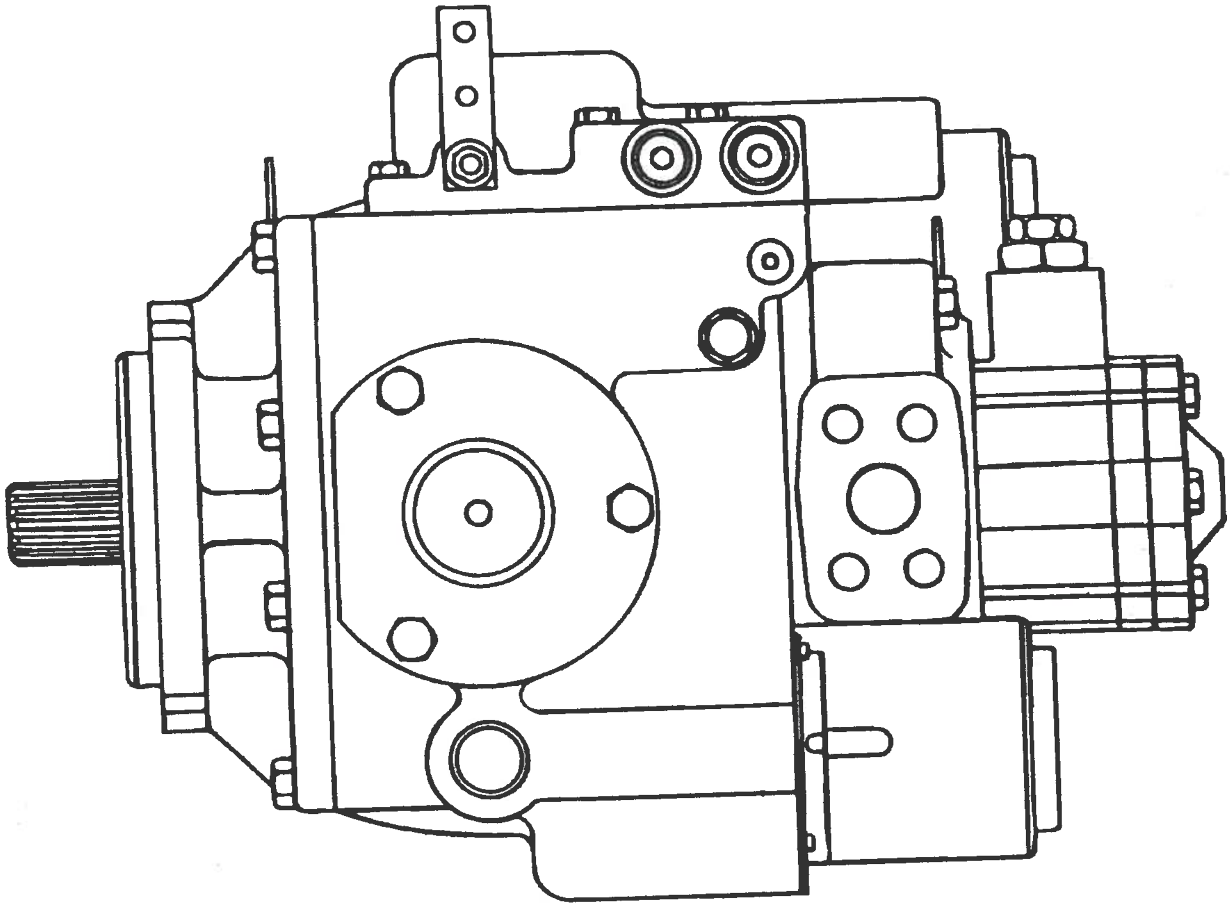
Parts Information

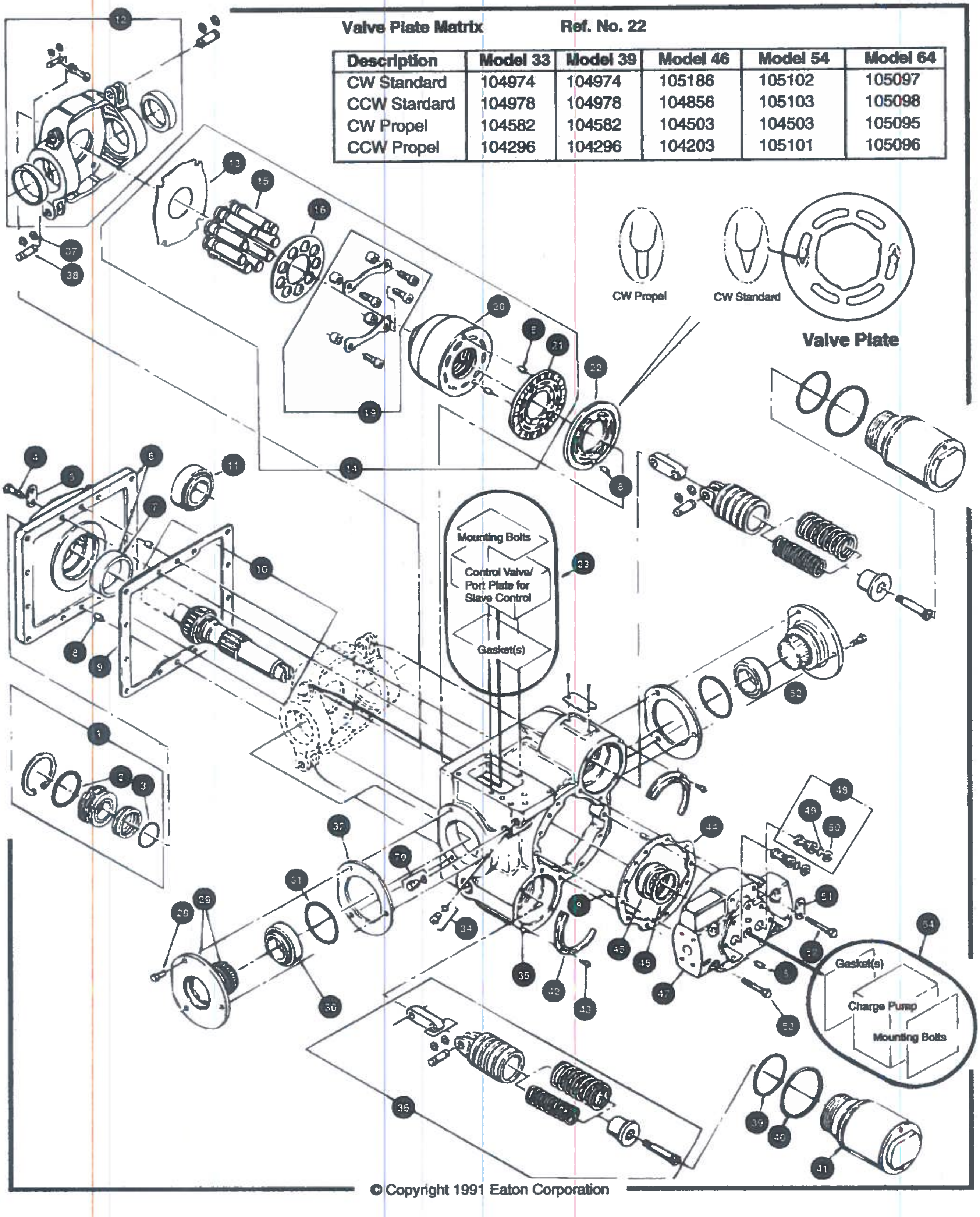
Hydrostatic Variable Pumps - Series 1, Models 33-64



Parts Drawing

Valve Plate Matrix **Ref. No. 22**

Description	Model 33	Model 39	Model 46	Model 54	Model 64
CW Standard	104974	104974	105186	105102	105097
CCW Stardard	104978	104978	104856	105103	105098
CW Propel	104582	104582	104503	104503	105095
CCW Propel	104296	104296	104203	105101	105096



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Ref. No.	Description	Qty	Model 33	Model 39	Model 46	Model 54	Model 64
1	Kit, Shaft Seal	1	990231	990231	990231	990231	990231
2	O-ring	1	8761-145	8761-145	8761-145	8761-145	8761-145
3	O-ring	1	104166-131	104166-131	104166-131	104166-131	104166-131
4	Bolt, Mounting Flange	12	95863-100	95863-100	95863-100	95864-125	95864-125
5	Strap, Shipping	2	96558	96558	96558	96559	96559
6	S/A, Mounting Flange	1	104207	104207	104207	103803	103803
7	Cup, Bearing	1	103232	103232	103232	103808	103808
8	Dowel	7	98202	98202	98202	98202	98202
9	Gasket, Mounting Flange	1	8828	8828	8828	8826	8826
10	S/A, Drive Shaft	1	*	*	*	*	*
11	Bearing Kit, Mtg. Flange	1	990389	990389	990389	990387	990387
12	S/A, Swashplate	1	104301	104226	104226	104463	104463
13	Plate, Thrust	1	103236	103236	103236	103809	103809
14	Kit, Rotating Group	1	990425	990425	990427	990429	990431
15	S/A, Piston Slipper	9	101073	101073	104199	101077	103818
16	Plate, Slipper Retaining	1	103244	103244	104211	103853	103817
19	Kit, Series 1 Hold Down	1	990416	990416	990416	990417	990417
20	Kit, Cylinder Barrel	1	909412	990412	990413	990414	990415
21	Plate, Bearing	1	103241	103241	104198	103852	103814
22	Plate, Valve	1	*	*	*	*	*
23	Option, Control	1	**	**	**	**	**
28	Bolt, Trunnion	6	95863-088	95863-088	95863-088	95864-088	95864-088
29	S/A, Trunnion	2	103982	103982	103982	23591	23591
30	Kit, Trunnion Bearing	2	990024	990024	990024	990024	990024
31	O-ring	3	8761-231	8761-231	8761-231	8761-234	8761-234
32	Shim Pack, Trunnion	2	9900012	990012	990012	990013	990013
34	S/A, O-ring Plug	1	25083-004	25083-004	25083-004	25083-004	25083-004
35	Housing	1	101838	101838	101838	103805	103805
36	S/A, Servo Pison	2	104401	104401	104401	102638	102638
37	Retaining Ring, External	4	95820-056	95820-056	95820-056	95820-056	95820-056
38	Pink, Linkage	2	95654	95654	95654	95654	95654
39	O-ring	2	8761-143	8761-143	8761-143	8761-234	8761-234
40	O-ring	2	8761-147	8761-147	8761-147	8761-237	8761-237
41	Kit, Servo Sleeve	2	990037	990037	990037	990038	990038
42	Retainer, Servo	2	95675	95675	95675	95844	95844
43	Screw, Cap	6	95890-038	95890-038	95890-038	95890-038	95890-038
44	Gasket, End Cover	1	8734	8734	8734	103042	103042
45	Kit, End Cover Bearing	1	990014	990014	990014	990016	990016
46	Shim Pack, Shaft	1	990017	990017	990017	990019	990019
47	End Cover	1	*	*	*	*	*
48	S/A, Check Valve	2	101187	101187	101187	101187	101187
49	O-ring	2	8765-113	8765-113	8765-113	8765-113	8765-113
50	Ring, Back-up	2	8770-113	8770-113	8770-113	8770-113	8770-113
52	Bolt, End Cover	6	103090-275	103090-275	103090-275	103091-300	103091-300
53	Bolt, End Cover	2	103090-150	103090-150	103090-150	103091-200	103091-200
54	Charge Pump	1	**	**	**	**	**
70	S/A, O-ring Plug	1	25090-004	25090-004	25090-004	25090-004	25090-004

* See charts on opposite page and back page for specific part number.

** See separate parts list for specific part number.

EATON
PARTS INFORMATION
HYDROSTATIC VARIABLE PUMPS
SERIES 1, MODELS 33 THRU 64
NO. 6-608

HOW TO ORDER
REPLACEMENT PARTS

EACH ORDER MUST INCLUDE
THE FOLLOWING INFORMATION

1. Product Number
2. Date Code
3. Part Name
4. Part Number
5. Quantity of Parts

Drive Shaft Matrix **Ref. No. 10**

Description	Model 33	Model 39	Model 46	Model 54	Model 64
1-1/2 Str. Keyed	104897	104897	104897	105074	105074
1-3/8 Tapered	104954	104954	N/A	105054	105054
1-3/8 Tapered*	105210	105210	N/A	N/A	N/A
14T-12/24P	104204	104204	104204	105050	105050
14T-12/24P*	104961	104961	104961	105072	105072
21T-16/32P	104586	104586	104586	105068	105068
21T-16/32P*	104933	104933	104933	N/A	N/A
23T-16/32P	104504	104504	104504	105064	105064
23T-16/32P*	N/A	N/A	N/A	104375	104375

101540 - 3/8 Square Key (for 1-1/2 Straight Keyed Shaft)
101017 - Woodruff Key (for 1-3/8 Tapered Shafts)
96898 – Slotted Nut (for 1-3/8 Tapered Shafts)
*With Splined Drive End for B Pad Charge Pump

End Cover Matrix **Ref. No. 47**

Description Main Ports	Model 33	Model 39	Model 46	Model 54	Model 64
1 inch Code 61	50515	50515	104209	50517	105080
1 inch Code 61 w/Pressure Tap	101433	101433	104210	101415	105107
1 inch Code 61 IPOR S/A	103152	103152	105017	103100	105177
1 inch Code 62	101331	101331	104577	102182	105081
1 inch Code 62 IPOR S/A	104913	104913		103466	105142
1 inch Code 62 w/Pressure Tap	101441	101441		101958	
1 inch O-ring	101490	101490	104265	101492	

Code 61 - SAE Code 61, Split Flange, 3000 PSI, Drilled and Tapped for 3/8-16 UNC 2B Thread Bolt
Code 62 - SAE Code 62, Split Flange, 6000 PSI, Drilled and Tapped for 7/16-14 UNC 2B Thread Bolt

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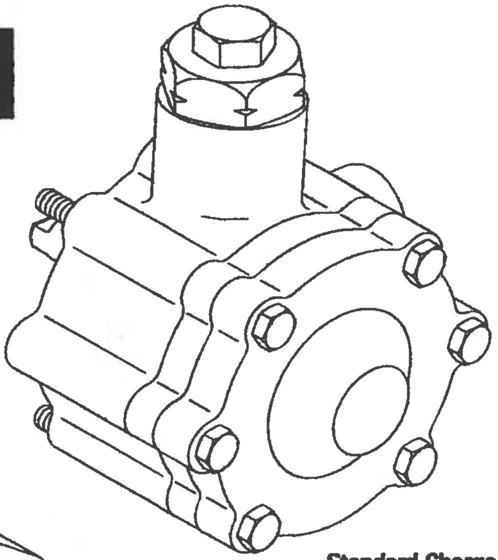
Eaton®

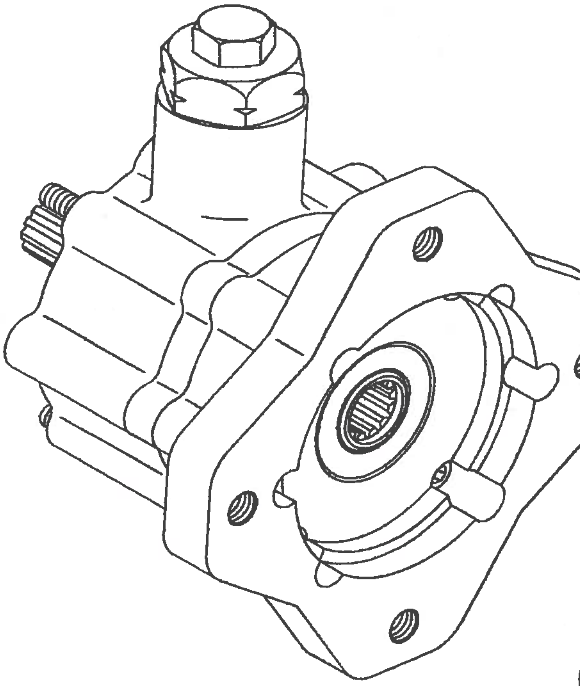
Heavy Duty Hydrostatic Pumps

No. 6-610
August, 1999

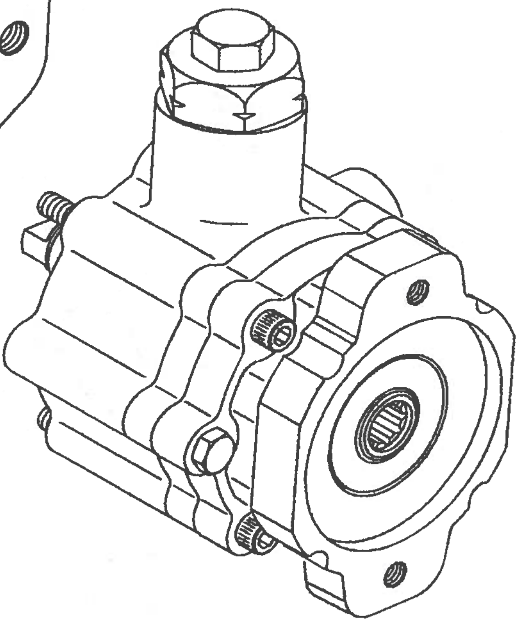
Parts Information



Standard Charge Pump



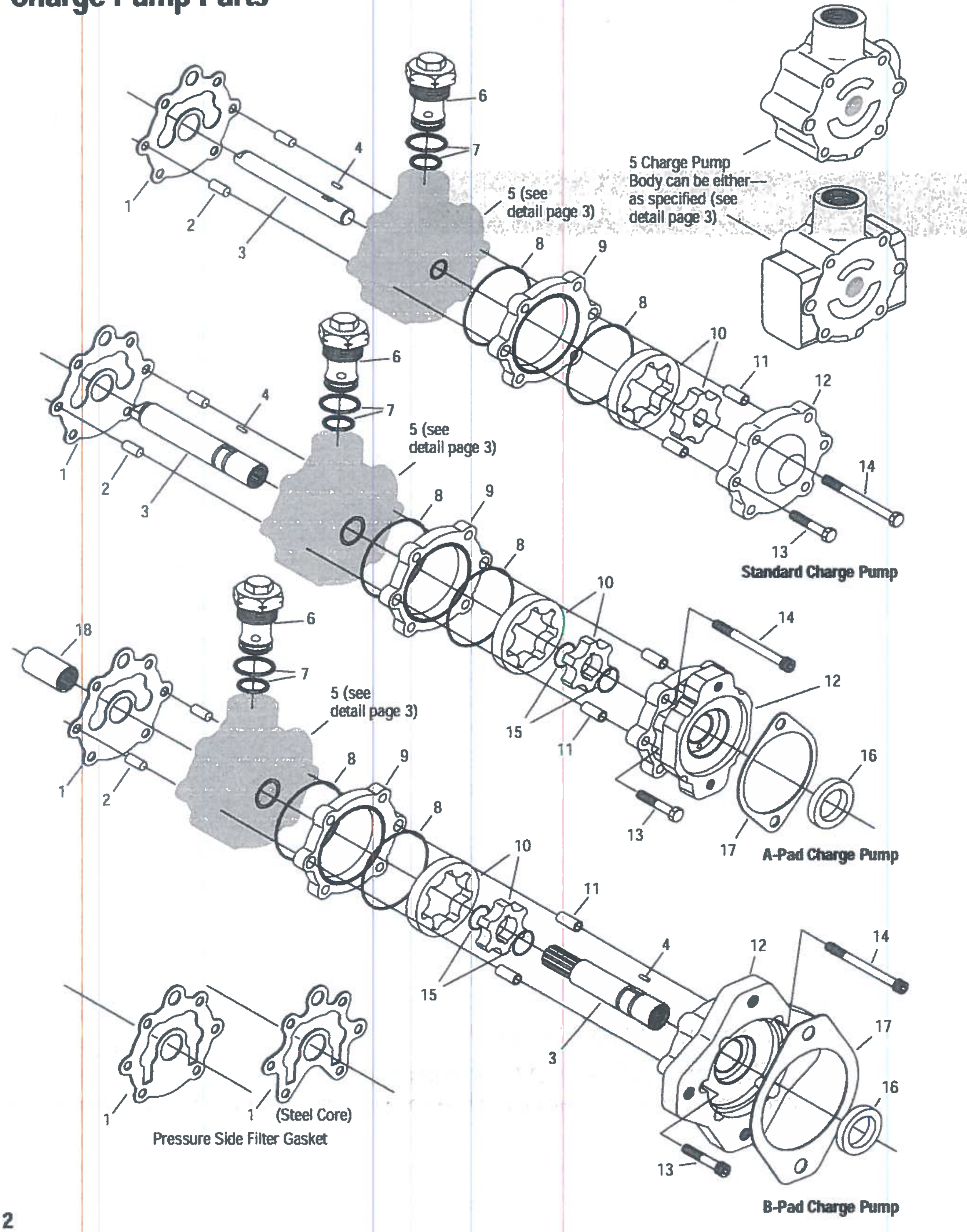
B-Pad Charge Pump



A-Pad Charge Pump

Standard Charge Pump, A-Pad and B-Pad Charge Pumps

Charge Pump Parts

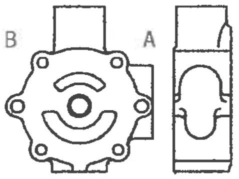


Ref. No.	Part Number Standard C/P	A-Pad C/P	B-Pad C/P	Description	Quantity Per Unit
1	101179-000	101179-000	101179-000	Gasket	1
	—	103020-000	103020-000	Gasket (pressure side filter)	1
	—	105106-000	105106-000	Gasket, Steel Core (pressure side filter)	1
2	98202-000	98202-000	98202-000	Dowel, Solid	2
3	*	*	*	Shaft	1
4	*	*	*	Pin, Drive	1
5	†	†	†	Body w/Bearing or w/Bushing	1
6	*	*	*	Valve, Relief (low pressure)	1
7	990104-000	990104-000	990104-000	O-rings (kit) (for relief valve)	1
8	102574-000	102574-000	102574-000	O-ring	2
9	*	*	*	Spacer	1
10	*	*	*	Gerotor	1
11	*	*	*	Dowel, Hollow	2
12	990106-000			Cover w/Bearing	1
		990364-000	990345-000	Cover w/Bushing — Dry (includes shaft seal, ref. no. 16)	1
		990482-000	990599-000	Cover w/Bushing — Wet	1
13	*	*	*	Bolt	2
14	*	*	*	Bolt, Mounting	4
15		102853-000	102853-000	Ring, Retaining	2
16		102561-000	103357-000	Seal, Shaft	1
17		102930-000	102919-000	Gasket	1
18			103365-000	Coupling, Splined	1

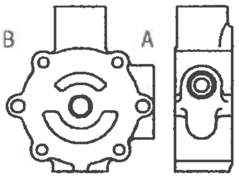
(Continued on Page 6)

* See Charts Page 4
† See Body, Charge Pump (below)

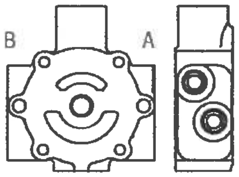
Item 5 — Body, Charge Pump (Bore and Bearing for Standard Shaft)



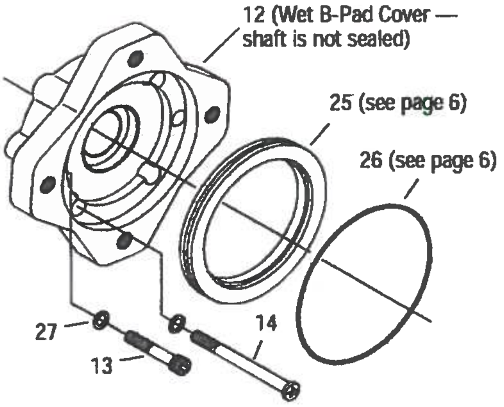
Internal Discharge Port
P/N 990107-000



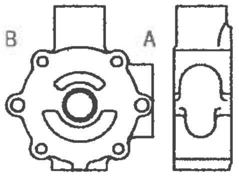
External Discharge Port
P/N 990546-000



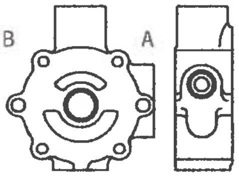
Remote Filter Ports
(A Side) P/N 990547-000



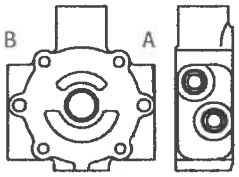
Item 5 — Body, Charge Pump (Bore and Bushing for A-Pad or B-Pad Shaft)



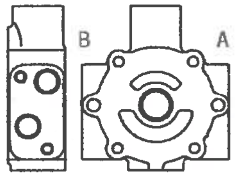
Internal Discharge Port
P/N 990344-000



External Discharge Port
P/N 990548-000



Remote Filter Ports
(A Side) P/N 990549-000



Press. Side Filter
(B Side) P/N 990458-000

Pressure Side Filter
Parts Drawing and
Parts List See Page 6

Charge Pump Parts List

Standard Charge Pump Displacement cm^3/r [in^3/r]

Ref. No.	Description	13,9 [.85] Part Number	Size**	21,0 [1.28] Part Number	Size**	27,9 [1.70] Part Number	Size**	34,7 [2.12] Part Number	Size* *
3	Shaft	101006-000	142 [5.60]	101007-000	147 [5.80]	101008-000	155 [6.10]	106567-212	161 [6.34]
4	Pin, Drive	101305-000	10 [.39]	101311-000	15 [.60]	101312-000	22 [.85]	106529-000	28 [1.10]
9	Spacer	101016-000	13 [.50]	101017-000	19 [.75]	101018-000	25 [1.00]	106518-000	32 [1.25]
10	Gerotor	22255-003	13 [.50]	22255-005	19 [.75]	22255-007	25 [1.00]	23397-008	32 [1.25]
11	Dowel, Hollow	95660-000	25 [1.00]	98011-000	32 [1.25]	98012-000	38 [1.50]	106539-000	44 [1.75]
13	Bolt	95862-175	44 [1.75]	95862-200	51 [2.00]	95862-225	57 [2.25]	95862-250	63 [2.50]
14	Bolt, Mounting	105663-350	89 [3.50]	105663-375	95 [3.75]	105663-400	102 [4.00]	105663-425	108 [4.25]

A-Pad Charge Pump Displacement cm^3/r [in^3/r]

Ref. No.	Description	13,9 [.85] Part Number	Size**	21,0 [1.28] Part Number	Size**	27,9 [1.70] Part Number	Size**	34,7 [2.12] Part Number	Size**
3	Shaft	103249-085	152 [6.00]	103249-128	160 [6.30]	103249-170	119 [4.70]	103249-212	170 [6.41]
4	Pin, Drive	101305-000	10 [.39]	101311-000	15 [.60]	101312-000	22 [.85]	106529-000	28 [1.10]
9	Spacer	101016-000	13 [.50]	101017-000	19 [.75]	101018-000	25 [1.00]	106518-000	32 [1.25]
10	Gerotor	22258-003	13 [.50]	22258-005	19 [.75]	22258-007	25 [1.00]	23396-008	32 [1.25]
11	Dowel, Hollow	95660-000	25 [1.00]	98011-000	32 [1.25]	98012-000	38 [1.50]	106539-000	44 [1.75]
13	Bolt	95862-175	44 [1.75]	95862-200	51 [2.00]	95862-225	57 [2.25]	95862-250	63 [2.50]
14	Bolt, Mounting	95912-350	89 [3.50]	95912-375	95 [3.75]	95912-400	102 [4.00]	95912-425	108 [4.25]

B-Pad Charge Pump Displacement cm^3/r [in^3/r]

Ref. No.	Description	13,9 [.85] Part Number	Size**	21,0 [1.28] Part Number	Size**	27,9 [1.70] Part Number	Size**	34,7 [2.12] Part Number	Size**
3	Shaft	103358-085	107 [4.20]	103358-128	147 [5.80]	103358-170	119 [4.70]	103358-212	126 [4.95]
4	Pin, Drive	101305-000	10 [.39]	101311-000	15 [.60]	101312-000	22 [.85]	106529-000	28 [1.10]
9	Spacer	101016-000	13 [.50]	101017-000	19 [.75]	101018-000	25 [1.00]	106518-000	32 [1.25]
10	Gerotor	22258-003	13 [.50]	22258-005	19 [.75]	22258-007	25 [1.00]	23396-008	32 [1.25]
11	Dowel, Hollow	95660-000	25 [1.00]	98011-000	32 [1.25]	98012-000	38 [1.50]	106539-000	44 [1.75]
13	Bolt	95912-175	44 [1.75]	95912-200	51 [2.00]	95912-225	57 [2.25]	95912-250	63 [2.50]
14	Bolt, Mounting	95912-350	89 [3.50]	95912-375	95 [3.75]	95912-400	102 [4.00]	95912-425	108 [4.25]
	Bolt, Mtg.***	107019-350	89 [3.50]	107019-375	95 [3.75]	107019-400	102 [4.00]	107019-425	108 [4.25]

**Size (length or width) is for part identification. It is a nominal dimension of the part that is affected by charge pump displacement. Part length or width is given in millimeter [inch].

***Pan Head Mounting Bolt for Wet B-Pad only (sealing washer required — see ref. no. 27 page 6)

Charge Pump Kits and Subassemblies

Each charge pump kit contains a charge pump subassembly, four mounting bolts, two dowels, and a gasket. If a charge pump subassembly is ordered it will be necessary to order mounting bolts, dowels, and a gasket.

The three x's that follow each charge pump and subassembly number indicate the pressure setting of the relief valve. Multiply this three digit number by ten to find the pressure setting in PSI.

Example: 022 X 10 = 220 PSI (see relief valve chart lower right for pressure setting and part number cross reference).

Standard Charge Pump

Kit No.	Subassembly	Displ.	Rotation/Features
990006-xxx	101000-xxx	13,9 [.85]	CCW
990007-xxx	101001-xxx	13,9 [.85]	CW
990008-xxx	101002-xxx	21,0 [1.28]	CCW
990009-xxx	101003-xxx	21,0 [1.28]	CW
990010-xxx	101004-xxx	27,9 [1.70]	CCW
990011-xxx	101005-xxx	27,9 [1.70]	CW
990433-xxx	101353-xxx	13,9 [.85]	CW w/Aux. Pres. Port
990434-xxx	101587-xxx	13,9 [.85]	CCW w/Aux. Pres. Port
990437-xxx	101588-xxx	21,0 [1.28]	CCW w/Aux. Pres. Port
990438-xxx	101589-xxx	21,0 [1.28]	CW w/Aux. Pres. Port
990441-xxx	101590-xxx	27,9 [1.70]	CCW w/Aux. Pres. Port
990443-xxx	101591-xxx	27,9 [1.70]	CW w/Aux. Pres. Port
990617-xxx	107161-xxx	34,7 [2.12]	CCW w/Aux. Pres. Port
990598-xxx	106532-xxx	34,7 [2.12]	CW w/Aux. Pres. Port
990435-xxx	103049-xxx	13,9 [.85]	CCW Remote Filter Ports
990439-xxx	103066-xxx	21,0 [1.28]	CCW Remote Filter Ports
990598-xxx	105553-xxx	27,9 [1.70]	CCW Remote Filter Ports
990440-xxx	103678-xxx	21,0 [1.28]	CW Remote Filter Ports
A-Pad Charge Pump			
990612-xxx	105119-xxx	13,9 [.85]	CCW w/Aux. Pres. Port
990352-xxx	103342-xxx	13,9 [.85]	CW
990353-xxx	103343-xxx	13,9 [.85]	CCW
990354-xxx	103344-xxx	21,0 [1.28]	CW
990355-xxx	103345-xxx	21,0 [1.28]	CCW
990446-xxx	103470-xxx	21,0 [1.28]	CW w/Aux. Pres. Port
990356-xxx	103346-xxx	27,9 [1.70]	CW
990357-xxx	103347-xxx	27,9 [1.70]	CCW
990449-xxx	103472-xxx	27,9 [1.70]	CW Remote Filter Ports
990600-xxx	107950-xxx	34,7 [2.12]	CCW w/Aux. Pres. Port
990610-xxx	104756-xxx	27,9 [1.70]	CCW w/Aux. Pres. Port
990611-xxx	105189-xxx	21,0 [1.28]	CCW w/Aux. Pres. Port
B-Pad Charge Pump			
990346-xxx	103336-xxx	13,9 [.85]	CW
990347-xxx	103337-xxx	13,9 [.85]	CCW
990348-xxx	103338-xxx	21,0 [1.28]	CW
990349-xxx	103339-xxx	21,0 [1.28]	CCW
990447-xxx	103441-xxx	21,0 [1.28]	CW w/Aux. Pres. Port
990448-xxx	103444-xxx	21,0 [1.28]	CCW w/Aux. Pres. Port
990350-xxx	103340-xxx	27,9 [1.70]	CW
990351-xxx	103341-xxx	27,9 [1.70]	CCW
990603-xxx	106534-xxx	34,7 [2.12]	CW

Wet B-Pad Charge Pump Kits (see page 6)

Displacement Conversion Kits

Each conversion kit contains:

Ref. No.		Ref. No.	
1.	Gasket (1)	9.	Spacer (1)
3.	Shaft (1)	10.	Gerotor (1)
4.	Drive Pin (1)	11.	Hollow Dowels (2)
8.	O-rings (2)	13.	Bolts (2)
		14.	Mtg. Bolts (4)

Standard Charge Pump

Displ.	Kit No.
13,9 [.85]	990025-000
21,0 [1.28]	990026-000
27,9 [1.70]	990027-000
34,7 [2.12]	990619-000

A-Pad Charge Pump

Displ.	Kit No.
13,9 [.85]	990310-000
21,0 [1.28]	990311-000
27,9 [1.70]	990312-000
34,7 [2.12]	990620-000

B-Pad Charge Pump

Displ.	Kit No.
13,9 [.85]	990379-000
21,0 [1.28]	990380-000
27,9 [1.70]	990381-000
34,7 [2.12]	990621-000

Low Pressure Relief Valves Part Numbers and pressure Relief Settings

Ref. No. 6 — Low Pressure Relief Valve

Pressure Setting Bar [PSI]	Relief Valve S/A No.
15 [220]	101048-022
17 [240]	101048-024
18 [260]	101048-026
19 [280]	103072-028
21 [300]	103072-030
23 [340]	103072-034
24 [350]	103072-035
26 [380]	103072-038

Charge Pump Kits

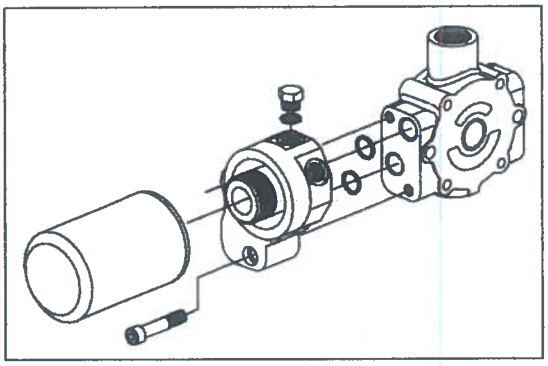
(Charge Pump Kits and Subassemblies Continued)

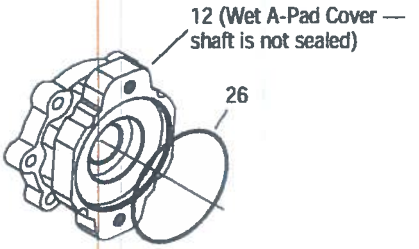
Wet A-Pad Charge Pump

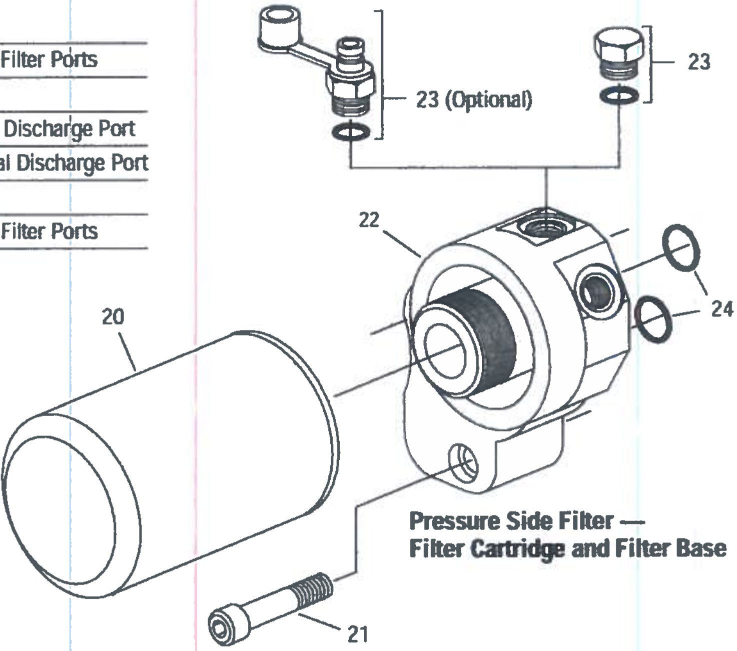
Kit No.	Subassembly	Displ.	Rotation/Features
990843-xxx	111343-xxx	13,9 [.85]	CCW
990844-xxx	110164-xxx	21,0 [1.28]	CW External Discharge Port
990845-xxx	111226-xxx	21,0 [1.28]	CCW External Discharge Port
990846-xxx	109704-xxx	21,0 [1.28]	CW Remote Filter Ports
990847-xxx	110086-xxx	27,9 [1.70]	CW External Discharge Port
990848-xxx	110540-xxx	27,9 [1.70]	CCW External Discharge Port

Wet B-Pad Charge Pump

Kit No.	Subassembly	Displ.	Rotation/Features
990627-xxx	107777-xxx	21,0 [1.28]	CW Remote Filter Ports
990629-xxx	107227-xxx	21,0 [1.28]	CW
990630-xxx	107500-xxx	21,0 [1.28]	CW External Discharge Port
990631-xxx	107978-xxx	21,0 [1.28]	CCW External Discharge Port
990632-xxx	108629-xxx	27,9 [1.70]	CW
990628-xxx	108364-xxx	27,9 [1.70]	CW Remote Filter Ports







Pressure Side Filter — Filter Cartridge and Filter Base

Ref. No.	A-Pad C/P	A-Pad (Wet) C/P	B-Pad C/P	B-Pad (Wet) C/P*	Description	Quantity Per Unit
20	104508-005	104508-005	104508-005	104508-005	Filter	1
21	95912-175	95912-175	95912-175	95912-175	Screw, Cap	2
22	104963-000	104963-000	104963-000	108528-000	Base, Filter	1
23	25090-006	25090-006	25090-006	25090-006	Plug/O-ring S/A	2
	8785-006	8785-006	8785-006	8785-006	O-ring	2
	104312-000	104312-000	104312-000	104312-000	Diagnostic Receptacle S/A (Optional)	1
	8785-006	8785-006	8785-006	8785-006	O-ring	1
	104515-000	104515-000	104515-000	104515-000	Dust Cover	1
24	8761-115	8761-115	8761-115	8761-115	O-ring	2
25				107018-000	Spacer	1
26		104166-158		104166-158	O-ring	1
27				106926-000	Washer	4

*Wet B-Pad Cover (Ref. No. 12) for Pressure Side Filter is 108527-000.

Charge Pump Kits

Notes:

Heavy Duty Hydrostatic Pumps

Charge Pumps

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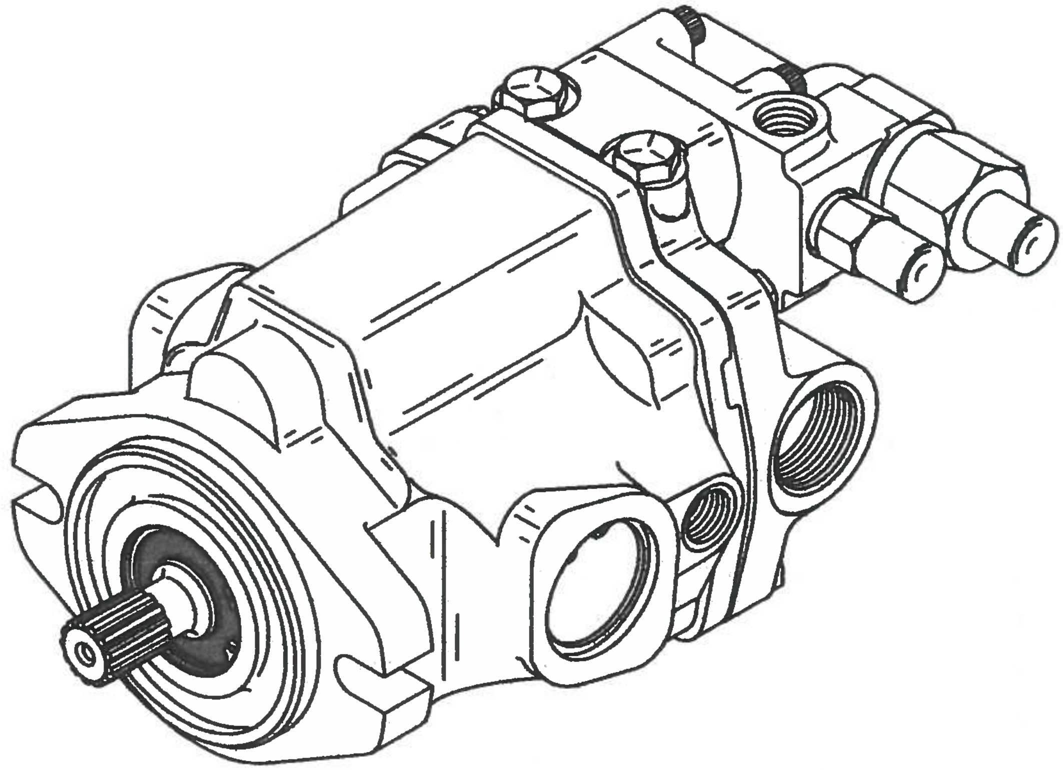
Form No. 6-610

EATON

Eaton®
Medium Duty Piston Pump

No. 6-615
January 1998

Parts and Repair Information



Model 70122, 0 -19 cm³/r [0-1.16 in³/r] Displacement
Pressure or Pressure-Flow Compensated Piston Pumps

Introduction

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Introduction

This manual provides service information for the Eaton Models 70122 Pressure or Pressure - Flow Compensated Piston Pumps. Step by step instructions for the complete disassembly, inspection, and reassembly of the pump are given. The following recommendations should be followed to insure successful repairs.

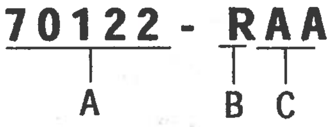
- Remove the pump from the application.
- Cleanliness is extremely important.
- Clean the port areas thoroughly before disconnecting the hydraulic lines.
- Plug the pump ports and cover the open hydraulic lines immediately after they're disconnected.
- Drain the oil and clean the exterior of the pump before making repairs.
- Wash all metal parts in clean solvent.
- Use compressed air to dry the parts. Do not wipe them dry with paper towels or cloth.
- The compressed air should be filtered and moisture free.
- Always use new seals when reassembling hydraulic pumps.
- Lubricate the new rubber seals with a petroleum jelly (Vaseline) before installation.
- Torque all bolts over gasketed joints, then repeat the torquing sequence to make-up for gasket compression.
- Verifying the accuracy of pump repairs on an authorized test stand is essential.

Identification and Tools Required

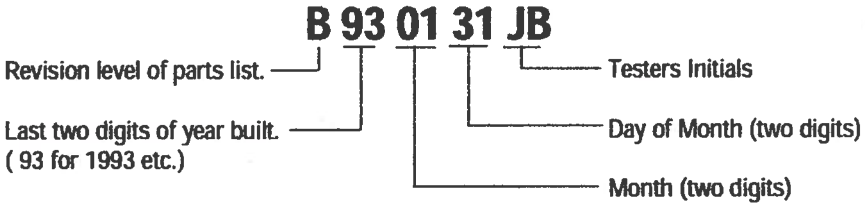
Identification Numbers - Pressure or Pressure-Flow Compensated Piston Pump
Stamped on each units mounting flange.

A - Product Number Description
  70122 = Single Piston Pump
B - Rotation
  L - Lefthand (CCW)
  R - Righthand (CW)
C - Sequential Numbering

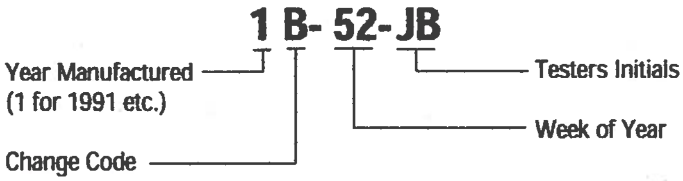
Single Pump - Product Number:



Serial Number Code:


B 93 01 31 JB
Revision level of parts list.
Last two digits of year built.
(93 for 1993 etc.)
Testers Initials
Day of Month (two digits)
Month (two digits)

Serial Number Code prior to Jan., 1992:

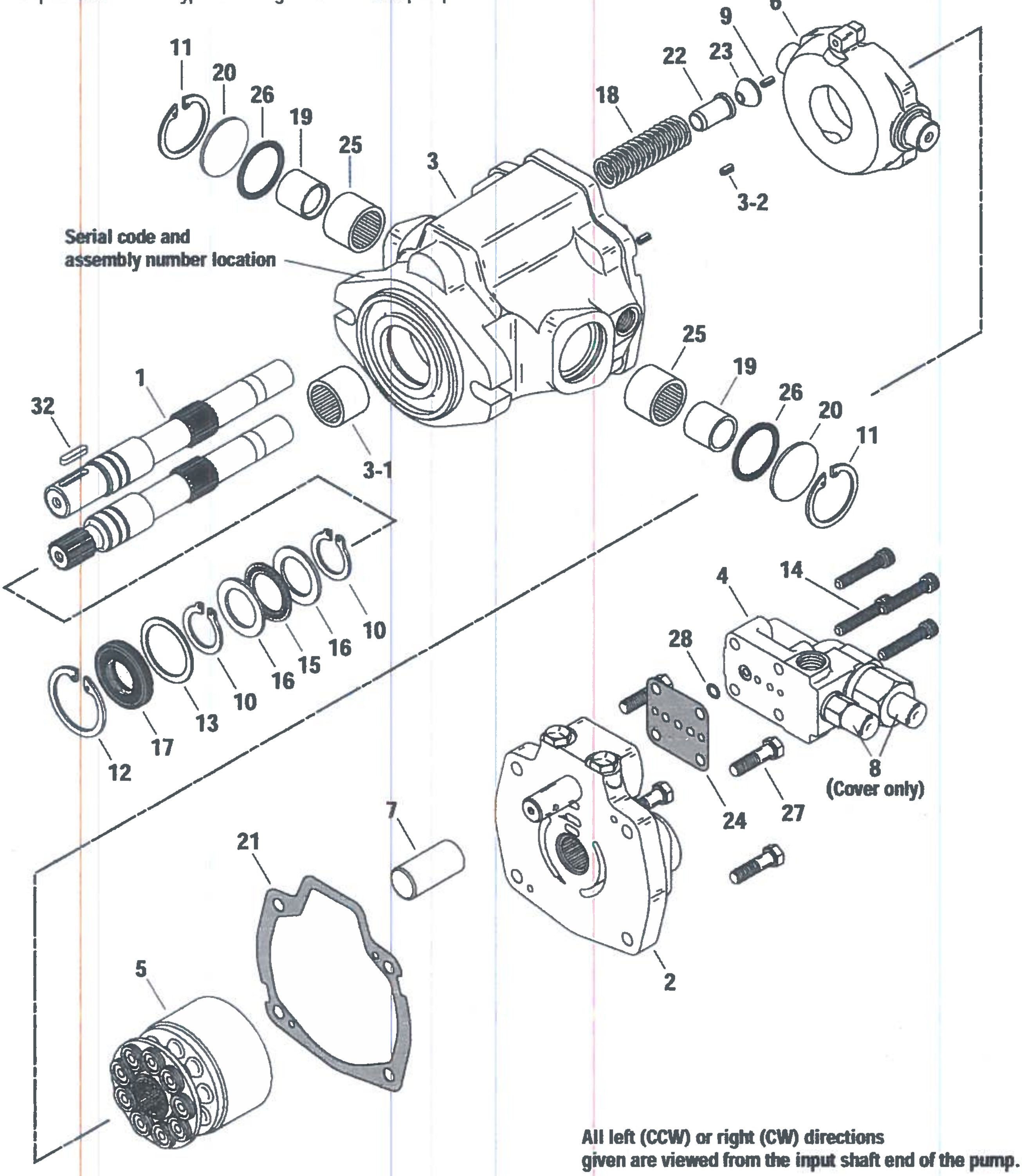


Tools Required

- 1/2 Inch Socket
- 1-1/8 Inch End Wrench
- 11/16 Inch End Wrench
- Rachet Wrench
- Torque Wrench (100 lb./ft.)
- 3/16 Inch Hex Key (Allen)
- 3/16 Inch Hex Key (Allen Socket)
- Soft Face Hammer
- Internal Retaining Pliers (Straight .070 Tip)
- External Retaining Pliers (Straight .070 Tip)
- Regular or Locking Pliers
- Seal Driver or Similar Tool
- Petroleum Jelly (Such as Vaseline)
- 5/16 I.D. x 15/16 O.D. flat washer (2 ea.)
- 5/16 x 2-7/8 N.C. Cap screw (1 ea.)
- 5/16 N.C. Nut

Parts Drawing

Pump drawn below is typical of a righthand rotation pump.



All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Parts List

Item	Part No.	Qty.	Description
1	◆	1	Drive Shaft (Identification drawing on page #6)
2	◆	1	Backplate Assembly (Identification drawing on page #7)
3	70102-301	1	Housing Assembly, .5625-18 - SAE Straight Thread O-ring Port - Right side of housing
3-1	16238-11616	1	Bearing
3-2	16026-608	2	Roll Pin
4	◆	1	Compensator Assembly (Identification drawing on page #8, 9 & 10)
5	◆	1	Rotating Kit Assembly (parts list on page #11)
6	70120-602	1	Camplate
7	70120-401	1	Control Piston
8	70422-618	2	Cover
9	16026-507	1	Roll Pin
+ 10	16078-16	2	Retaining Ring
+ 11	16077-24	2	Retaining Ring
+ 12	16077-26	1	Retaining Ring
13	16048-312	1	Washer
14	16148-412	4	Cap Screws
15	16241-1625	1	Thrust Bearing
16	16241-C1625	2	Bearing Race
+ 17	16253-16	1	Shaft Seal
17	16253-216	1	Shaft Seal, Drive (fluorocarbon rubber)
18	17073-6	1	Spring
19	70101-150	2	Inner Race
20	70111-622	2	Trunnion Cover
+ 21	70111-701	1	Gasket
22	70120-600	1	Spring Collar
23	70120-601	1	Button
+ 24	70422-600	1	Gasket
25	76100-191	2	Thrust Bearing
+ 26	16015-25	2	O-ring, 3/32 x 1-5/16 ID
27	16032-512	4	Cap Screw
+ 28	16003-5-90	1	O-ring, 1/16 x 1/4 ID 90 DUR
32	16246-427	1	Key, Used on 19.05 [.75] diameter shaft
32	24500-619	1	Key, Used on 22.2 [.875] diameter shaft

Seal Repair Kit

•	70122-902	1	Seal Repair Kit

Legend

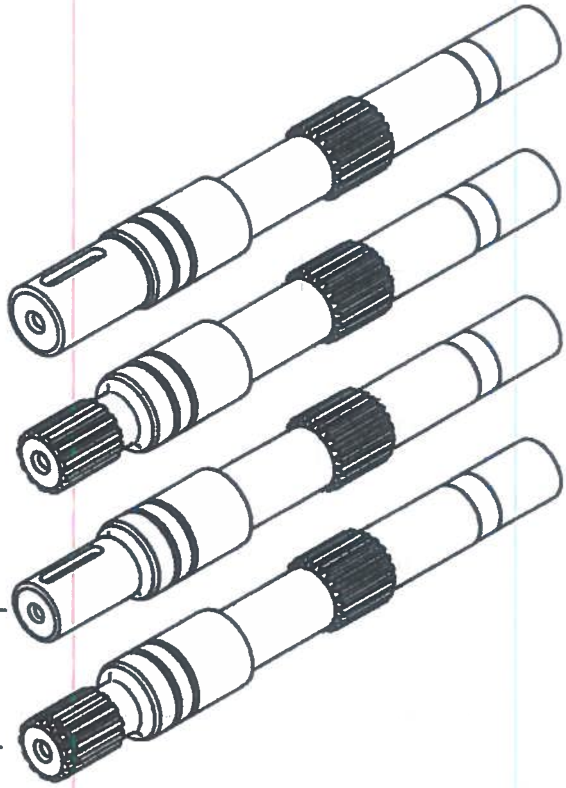
◆ Refer to specific item parts list.

+ Included in seal repair kits listed.

Item 1 - Drive Shaft Identification

Item 1

Drive Shaft Identification



Part Number **Input Drive**

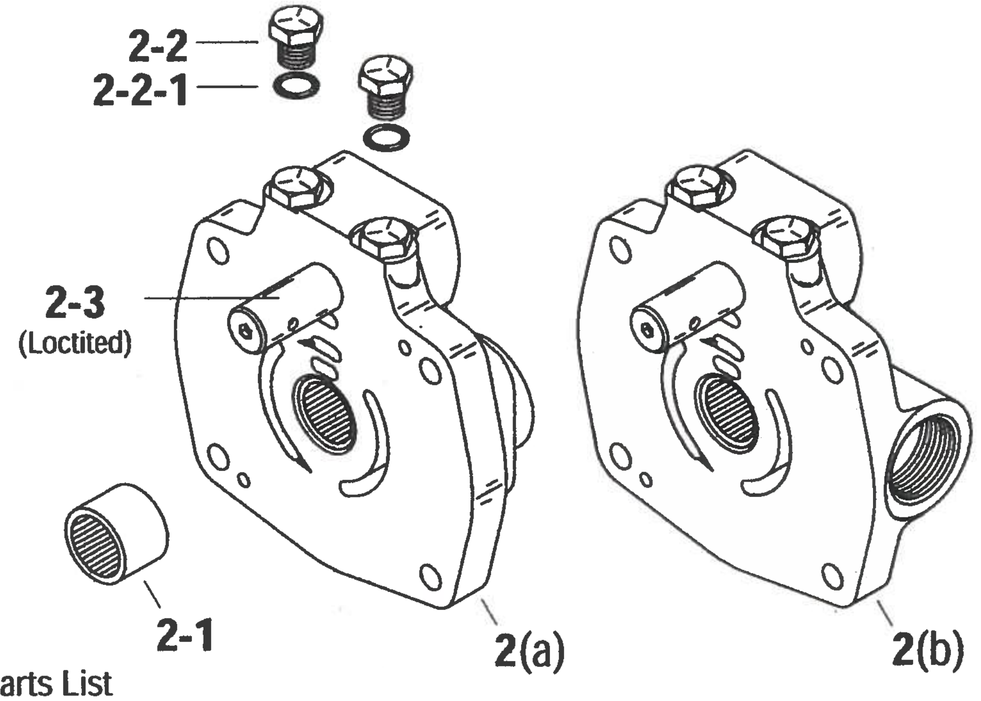
70122-203,
22.2 [.875] Dia. keyed

70102-200, 13 Tooth

70122-200,
19.05 [.75] Dia. keyed

70102-201, 13 Tooth
w/ Retaining Ring Groove

Item 2 - Backplate Assembly

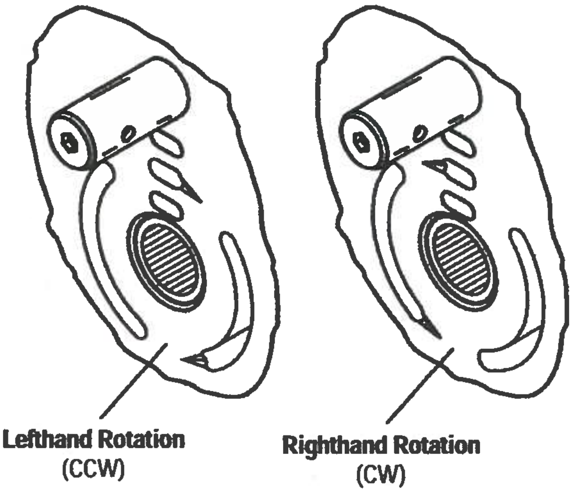


Item 2 - Parts List

Item	Lefthand Rotation Part No.	Righthand Rotation Part No.	Qty.	Description
2(a)	70120-311	70120-309	1	Rear Porting Backplate Assembly
2(b)	70120-314	70120-318	1	Opposite Side Porting Backplate Assembly
2-1	70420-43		1	Bearing
2-2	16103-103		2	Plug Assembly
+ 2-2-1	16133-3		2	O-ring, 1.59 mm Dia. x 7.54 mm I.D. [.0625 in. Dia. x .2969 in. I.D.]
2-3	70120-400		1	Guide Pin

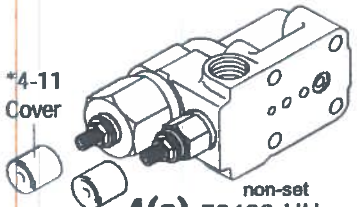
Legend + Included in seal repair kit listed on page 5.

All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

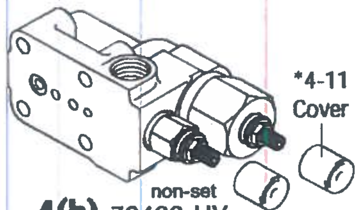


Item 4 - Compensator Assembly

Pressure-Flow Compensator

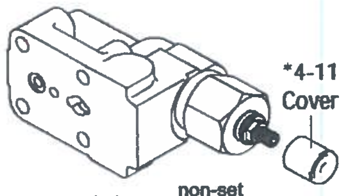


4(a) 70422-HU
Lefthand (CCW) **Pump Rotation**



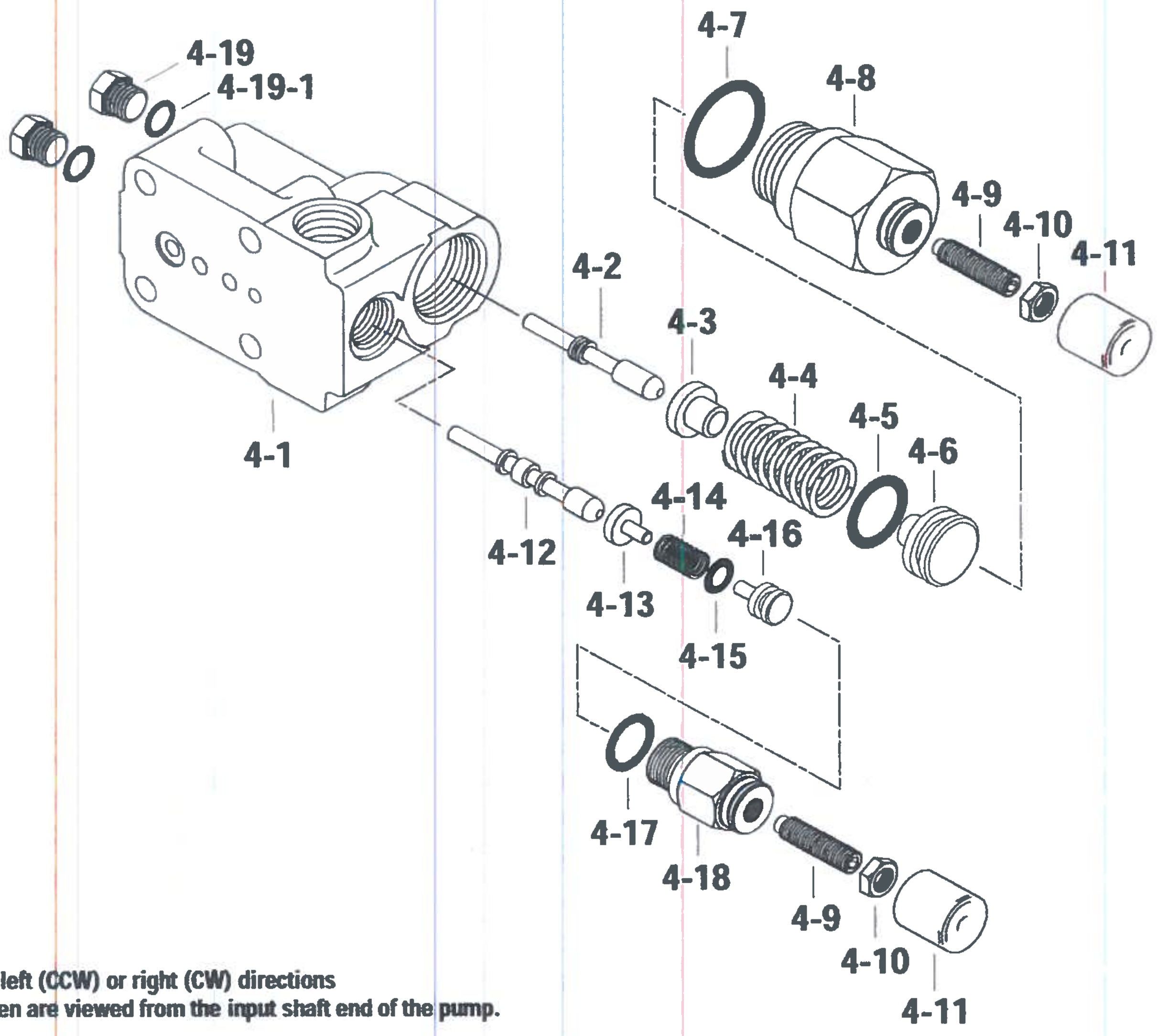
4(b) 70422-HY
Righthand (CW) **Pump Rotation**

Pressure Compensator



4(c) 70422-HR
Fits Both Pump Rotations
(Righthand (CW) rotation shown)

*4-11, Cover not included with non-set compensator assy.



All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Item 4 - Compensator Parts List

Item 4 - Parts List (Refer to drawings)

	Item	Part No.	Qty.	Description
	4(a)	70422-HU	1	Non-Set Pressure-Flow Compensator Assembly, Lefthand Rotation
	4(b)	70422-HY	1	Non-Set Pressure-Flow Compensator Assembly, Righthand Rotation
	4(c)	70422-HR	1	Non-Set Pressure Compensator Assembly
	4-1	N/S	1	Compensator Body
	4-2	N/S	1	Pressure Spool
	4-3	70422-405	1	Spring Pivot Cap
	4-4	17063-11	1	Spring
+	4-5	16003-11	1	O-ring, 2.38 mm Dia. x 14.29 mm I.D. [.0937 in. Dia. x .5625 in. I.D.]
	4-6	70421-453	1	Pressure Spring Follower
+	4-7	16015-18	1	O-ring, 2.38 mm Dia. x 22.23 mm I.D. [.0937 in. Dia. x .875 in. I.D.]
	4-8	70422-606	1	Adjustment Cap, Pressure
	4-9	70422-620	1or2	Set Screw
	4-10	16024-4	1or2	Nut
	4-11*	70422-618*	1or2	Cover*
	4-12	N/S	1	Flow Spool
	4-13	70411-411	1	Spring Pivot Cap
	4-14	17029-5	1	Spring
+	4-15	16003-4-90	1	O-ring, 1.59 mm Dia. x 5.55 mm I.D. [.0625 in. Dia. x .2187 in. I.D.]
	4-16	70421-477	1	Flow Spring Follower
+	4-17	16133-6	1	O-ring, 1.98 mm Dia. x 11.89 mm I.D. [.078 in. Dia. x .468 in. I.D.]
	4-18	70422-602	1	Adjustment Cap Flow
	4-19	16103-103	2	Plug Assembly
+	4-19-1	16133-3	2	O-ring, 1.59 mm Dia. x 7.54 mm I.D. [.0625 in. Dia. x .2969 in. I.D.]

Legend + Included in seal repair kit listed on page 5.
NSS Not Sold Separately

* Covers are not included with Non-Set Compensator

Factory Pre-set Compensator Assemblies listed on page #10.

Factory Pre-set Compensator Assemblies

Pre-set Pressure-Flow Compensator Assemblies

Non-Set Assembly	Pre-set Assembly	Pump Rotation	Pressure Setting	Flow Setting
70422-HU	**70422-AY-03**	Lefthand (CCW)	210±3.5 bar [3050±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HU	**70422-BH-03**	Lefthand (CCW)	191±2.1 bar [2770±30 lbf/in^2]	15.2±0.7 bar [220±10 lbf/in^2]
70422-HU	**70422-BL-03**	Lefthand (CCW)	183±3.5 bar [2650±50 lbf/in^2]	25.2±1.8 bar [365±25 lbf/in^2]
70422-HU	**70422-DE-03**	Lefthand (CCW)	193±3.5 bar [2800±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HU	**70422-DU-03**	Lefthand (CCW)	176±3.5 bar [2550±50 lbf/in^2]	19.0±1.8 bar [275±25 lbf/in^2]
70422-HU	**70422-EQ-03**	Lefthand (CCW)	210±3.5 bar [3050±50 lbf/in^2]	25.9±1.8 bar [375±25 lbf/in^2]
70422-HU	**70422-GD-03**	Lefthand (CCW)	176±3.5 bar [2550±50 lbf/in^2]	17.2±1.8 bar [250±25 lbf/in^2]
70422-HU	**70422-GN-03**	Lefthand (CCW)	155±3.5 bar [2250±50 lbf/in^2]	19.0±1.8 bar [275±25 lbf/in^2]
70422-HU	**70422-GP-03**	Lefthand (CCW)	169±3.5 bar [2450±50 lbf/in^2]	19.0±1.8 bar [275±25 lbf/in^2]
70422-HU	**70422-HL-03**	Lefthand (CCW)	210±3.5 bar [3050±50 lbf/in^2]	24.5±1.0 bar [355±15 lbf/in^2]
70422-HY	**70422-BM-01**	Righthand (CW)	210±3.5 bar [3050±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HY	**70422-BU-01**	Righthand (CW)	131±3.5 bar [1900±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HY	**70422-DB-01**	Righthand (CW)	238±3.5 bar [3450±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HY	**70422-DJ-01**	Righthand (CW)	210±3.5 bar [3050±50 lbf/in^2]	25.9±1.8 bar [375±25 lbf/in^2]
70422-HY	**70422-DW-01**	Righthand (CW)	155±3.5 bar [2250±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HY	**70422-ED-01**	Righthand (CW)	169±3.5 bar [2450±50 lbf/in^2]	19.0±1.8 bar [275±25 lbf/in^2]
70422-HY	**70422-ET-01**	Righthand (CW)	176±3.5 bar [2550±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HY	**70422-EZ-01**	Righthand (CW)	176±3.5 bar [2550±50 lbf/in^2]	17.2±0.7 bar [250±10 lbf/in^2]
70422-HY	**70422-FB-01**	Righthand (CW)	191±2.1 bar [2770±30 lbf/in^2]	15.2±0.7 bar [220±10 lbf/in^2]
70422-HY	**70422-FL-01**	Righthand (CW)	193±3.5 bar [2800±50 lbf/in^2]	20.7±1.0 bar [300±15 lbf/in^2]
70422-HY	**70422-FR-01**	Righthand (CW)	210±3.5 bar [3050±50 lbf/in^2]	19.0±1.8 bar [275±25 lbf/in^2]
70422-HY	**70422-GA-01**	Righthand (CW)	172±3.5 bar [2500±50 lbf/in^2]	20.7±0.7 bar [300±10 lbf/in^2]
70422-HY	**70422-GR-01**	Righthand (CW)	193±3.5 bar [2800±50 lbf/in^2]	17.2±1.8 bar [250±25 lbf/in^2]
70422-HY	**70422-GU-01**	Righthand (CW)	210±3.5 bar [3050±50 lbf/in^2]	17.2±1.8 bar [250±25 lbf/in^2]
70422-HY	**70422-HK-01**	Righthand (CW)	210±3.5 bar [3050±50 lbf/in^2]	24.5±1.0 bar [355±15 lbf/in^2]
70422-HY	**70422-HM-01**	Righthand (CW)	176±3.5 bar [2550±50 lbf/in^2]	24.5±1.0 bar [355±15 lbf/in^2]

Pre-set Pressure Compensator Assembly

Non-Set Assembly	Pre-set Assembly	Pump Rotation	Pressure Setting
70422-HR	**70422-CA-04**	Both	210±3.5 bar [3050±50 lbf/in^2]
70422-HR	**70422-CH-04**	Both	162±3.5 bar [2350±50 lbf/in^2]
70422-HR	**70422-CK-04**	Both	148±3.5 bar [2150±50 lbf/in^2]
70422-HR	**70422-CL-04**	Both	141±3.5 bar [2050±50 lbf/in^2]
70422-HR	**70422-CR-04**	Both	107±3.5 bar [1550±50 lbf/in^2]
70422-HR	**70422-DH-04**	Both	176±1.8 bar [2550±25 lbf/in^2]
70422-HR	**70422-FG-04**	Both	159±3.5 bar [2300±50 lbf/in^2]
70422-HR	**70422-GE-04**	Both	169±1.8 bar [2450±25 lbf/in^2]
70422-HR	**70422-HB-04**	Both	190±3.5 bar [2750±50 lbf/in^2]
70422-HR	**70422-HE-04**	Both	110±3.5 bar [1600±50 lbf/in^2]
70422-HR	**70422-HN-04**	Both	114±1.8 bar [1650±25 lbf/in^2]

All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

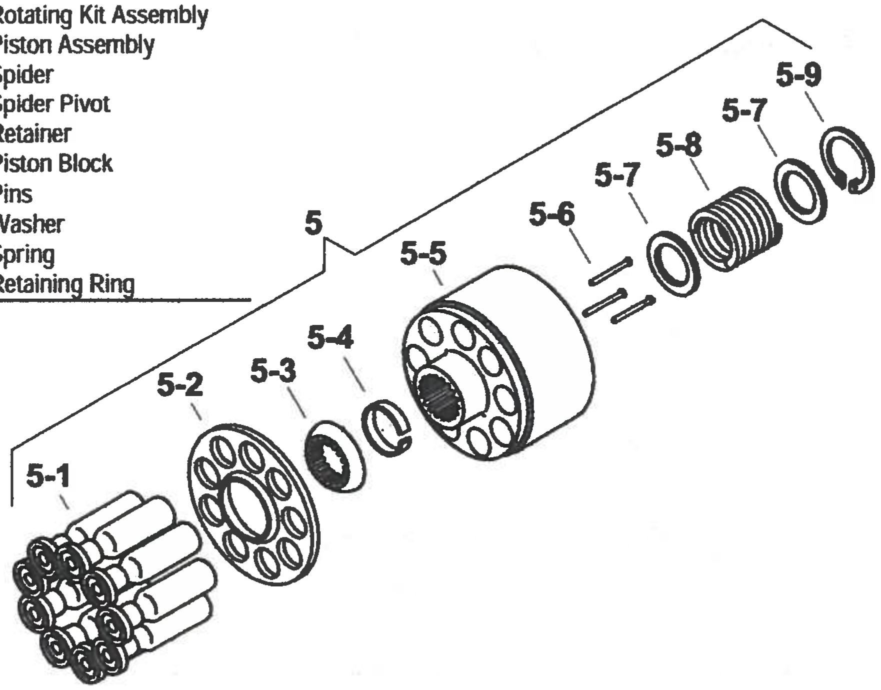
Item 5 - Rotating Kit Assembly

Item 5

Rotating Kit Assembly

Item	Part No.	Qty.	Description
5	70111-695	1	Rotating Kit Assembly
5-1	NSS	9	Piston Assembly
5-2	NSS	1	Spider
5-3	NSS	1	Spider Pivot
5-4	NSS	1	Retainer
5-5	NSS	1	Piston Block
5-6	NSS	3	Pins
5-7	NSS	2	Washer
5-8	NSS	1	Spring
5-9	NSS	1	Retaining Ring

NSS - Not Sold Separately



Product Number

This list of product numbers is to aid in Item identification.
If your product number is not listed contact your Eaton representitive.

Model 70122, Lefthand Rotation (CCW)

Product Number	Description of Part Number Drive Shaft Item #1	Backplate Assy. Item #2	Housing Assy. Item #3	Compensator Assy. Item #4
70122-LAE	70102-201	70120-311	70102-301	70422-CA-04
70122-LAF	70102-201	70120-311	70102-301	70422-AY-03
70122-LAN	70122-203	70120-311	70102-301	70422-CA-04
70122-LAP	70122-203	70120-311	70102-301	70422-AY-03
70122-LAW	70102-200	70120-314	70102-301	70422-AY-03
70122-LAY	70102-200	70120-314	70102-301	70422-CA-04
70122-LAZ	70122-203	70120-314	70102-301	70422-AY-03
70122-LBA	70122-203	70120-314	70120-314	70422-CA-04

Model 70122, Righthand Rotation (CW)

Product Number	Description of Part Number Drive Shaft Item #1	Backplate Assy. Item #2	Housing Assy. Item #3	Compensator Assy. Item #4
70122-RAG	70102-201	70120-311	70120-314	70422-BM-01
70122-RAH	70102-201	70120-311	70120-314	70422-CA-04
70122-RAL	70122-203	70120-311	70120-314	70422-BM-01
70122-RAM	70122-203	70120-311	70120-314	70422-CA-04
70122-RAV	70102-200	70120-314	70120-314	70422-BM-01
70122-RAW	70102-200	70120-314	70120-314	70422-CA-04
70122-RAY	70122-203	70120-314	70120-314	70422-BM-01
70122-RAZ	70122-203	70120-314	70120-314	70422-CA-04

Repair Information

Cleanliness is extremely important when repairing these pumps. Work in a clean area. Before disconnecting the lines clean port area of pump. Disconnect hydraulic lines and remove pump assembly from vehicle and plug ports. Thoroughly clean the outside of pump. After cleaning, remove port plugs and drain oil.

Disassembly

ATTENTION: Removal of the adjusting screw covers from cap may void the warranty on this assembly.

1 Clamp the end of the drive shaft in a protected jaw vise with the body of the pump up and remove the four allen head screws (14) holding compensator (4).

2 Remove the compensator assembly (4), O-ring (28), and gasket (24).

3 Remove the four cap screws (27) from the backplate of the pump.

4 Place a screw driver in slots provided between housing and loosen backplate. Remove backplate (2) and gasket (21) from housing.

5 Remove the control piston (7) remaining on the backplate or in housing. Also remove plug (2-2) from backplate (2).

6 To remove rotating assembly (5) from housing, remove pump from vise and slide rotating assembly off shaft. Caution: pistons may not come out with piston block.

7 Remove pistons (5-1), spider (5-2), and spider pivot (5-3) from piston block (5-5).

8 The piston block assembly (5-5) need not be disassembled unless the internal pins (5-6) or spring (5-8) are damaged.

CAUTION: Use the following procedure if the spring is to be removed from the piston block. The spring (5-8) is highly compressed and the snap ring (5-9) should not be removed without compressing the spring.

The following parts will be needed to disassemble the piston block:

2 ea. 5/16 I.D. x 15/16 O.D. flat washer,

1 ea. 5/16 x 2-7/8 N.C. cap screw, and

1 ea. 5/16 N.C. nut.

Place one of the flat washers over the 5/16 x 2-7/8 cap screw and place this through the center of the piston block. Place the other washer over the cap screw and let it rest on the three pins. Screw the nut on and compress the spring inside the piston block. Use a pair of snap ring pliers and remove the internal snap ring (5-9). Remove the nut and bolt along with the two washers (5-7), three pins (5-6), and the internal pin keeper (5-4).

9 To free shaft seal and shaft, remove retaining ring (12).

10 Remove shaft (1) from housing (3) by tapping backplate end of shaft with a wooden or plastic mallet.

11 Remove shaft seal (17), washer (13), the two retaining rings (10), the two thrust washers (16), and bearing (15) from shaft.

12 To remove the camplate (6) from the housing, remove the two internal retaining rings (11) from the sides of the housing. Remove the two covers (20), the two o-rings (26), the two inner races (19), and the bearings (25). The camplate can now be moved over to one side and removed. The two camplate pivot bearings are a loose slip fit into the housing. Do not be concerned if they are not tight.

13 Remove the spring collar (22) and spring (18). Do not remove the button (23) and roll pin (9) unless they are worn or loose.

14 The pressure-flow compensator assembly (4)

Repair Information

may be disassembled for cleaning and inspection.

ATTENTION: Removal of the adjusting screw covers from cap may void the warranty on this assembly.

15 Remove pressure adjustment cap (4-8) from compensator housing (4-1). Pressure spring follower (4-6) will remain in cap (4-8), pull follower from cap.

16 Remove flow adjustment cap (4-18) from compensator housing (4-1). Flow spring follower (4-16) will remain in cap (4-18). Pull follower from cap.

17 Remove springs (4-4 and 4-14) and spring pivots (4-3 and 4-13) from compensator housing.

18 Remove plugs (4-19), pressure compensator spool (4-2), and flow compensator spool (4-12) from compensator housing (4-1).

19 The shaft seal, all O-rings, and all gaskets should be removed and replaced with new items upon reassembly.

Inspect Parts For Wear

1 Inspect the flat surface of the backplate (2), the finish on the piston block side should be smooth and free of grooves. The piston guide should be tight in the backplate. The needle bearing in the backplate should be free of excessive play and remain in the bearing cage. If the backplate has any of the wear characteristics outlined above, replace complete backplate assembly.

2 Inspect the piston block (5). The surface that contacts the backplate should be smooth and free of grooves.

3 The pistons (5-1) should move freely in the piston block bore. If they stick in the bore, examine the bore for scoring or contamination.

4 Examine the O.D. of the piston (5-1) for finish condition. They should not show wear or deep scratches. The shoes should be a snug fit on the ball end of the piston. The flat surface of the shoes should be flat, and smooth. Do not lap piston shoes.

5 Examine the spider (5-2). It should be flat, no cracks, and no signs of wear in the pivot area.

6 Examine the pivot (5-3). It should be smooth and show no signs of wear.

7 Inspect the camplate (6) for the condition of finish of the polished shoe surface. It should show no signs of scoring.

8 Inspect shaft (1) for wear in bearing and spline areas.

9 Inspect thrust bearing (15) and thrust washers (16) for wear.

10 Inspect the needle bearing in the housing assembly (3). If the needles are free of excessive play and remain in the bearing cage, there is no need to replace the housing.

11 Inspect the compensator springs (4-4 and 4-14) for breakage or weakness.

12 Inspect the spools (4-2 and 4-12) for scoring.

13 It is not necessary to inspect the o-rings, retaining rings, gaskets, or shaft seal as they should be replaced as new items and are included in the seal repair kit available for this assembly.

Reassembly

1 Clean all parts in suitable solvent; lubricate all critical moving parts before reassembly.

2 Install camplate control spring (18) and spring collar (22) in housing (3).

3 Insert camplate (6) into housing (3). Insert needle bearings (25) and bearing inner race (19) over the camplate arms and slide into housing (3). The numbered end of the bearing should face outward

Repair Information

and the chamfered I.D. of the race should face inward.

4 Install new O-ring (26) around O.D. of camplate pivot bearing (25). Install trunnion covers (20) and secure with retaining rings (11).

5 Install retaining ring (10) on shaft (1). Install thrust washer (16), thrust bearing (15), and second thrust washer (16). Secure with second retaining ring (10).

6 Install shaft (1) in housing (3) and install washer (13), shaft seal (17), and retain with retaining ring (12). Make sure retaining ring is seated in the groove.

7 If piston block assembly was disassembled, compress the pin keeper (5-4), and install in the spline area of piston block. Install the three pins (5-6) with the head end to the inside of the block and install in the special grooves of the piston block spline.

8 Install the washer (5-7), spring (5-8), and second washer (5-7) in the piston block. Use the two 5/16 I.D. washers and the 5/16 x 2-7/8 cap screw to compress the spring and retain with retaining ring (5-9). Remove the 5/16 x 2-7/8 cap screw and the two washer.

9 Install the pivot (5-3), spider (5-2), and piston assemblies (5-1) in the piston block. Install this assembly in the housing assembly, the piston shoes must be in contact with the camplate. Be sure all the parts are in their proper position.

10 Clamp this assembly in a protected jaw vise with the open end of the housing (3) up.

11 Install new gasket (21).

12 Install control piston (7), and plug (2-2) with new o-ring onto backplate. Note roll pin (3-2) locations.

13 Install backplate (2) and retain with cap screws (27). Torque to 23 to 27 N-m [17 to 20 lb-ft].

14 Place new o-ring (4-19-1) on plug (4-19). Install plug assembly, flow compensator spool (4-12), spring pivot (4-13), spring (4-14), flow spring follower (4-16) with new o-ring (4-15), and flow adjustment cap (4-18) with new o-ring (4-17) into compensator housing (4-1). Torque plug (4-19) 8 to 11 N-m [6 to 8 lb-ft] and torque flow adjustment cap (4-18) 14 to 16 N-m [10 to 12 lb-ft].

15 Place new O-ring (4-19-1) on plug (4-19). Install plug assembly, pressure compensator spool (4-2), spring pivot (4-3), spring (4-4), pressure spring follower (4-6) with new o-ring (4-5), and pressure adjustment cap (4-8) with new o-ring (4-7) into compensator housing (4-1). Torque plug (4-19) 8 to 10 N-m [6 to 8 lb-ft] and torque pressure adjustment cap (4-18) 47 to 54 N-m [35 to 40 lb-ft].

16 Install new gasket (24) and new o-ring (28), then install compensator assembly (4),and retain with four allen head cap screws (14) and torque to 14 to 16 N-m [10 to 12 lb-ft].

17 Plug ports to preserve cleanliness until installation on vehicle. (Refer to start up procedures.)

Start-up Procedure

When initially starting a rebuilt load sensing system, it is extremely important that the start-up procedure be followed. It prevents the chance of damaging the pump which might occur if the system was not properly purged with oil before start-up.

1 After the pump has been properly installed onto the machine and all hydraulic connections have been made, check all fittings to make sure that they are tight.

2 Fill the pump housing at least 1/2 full with system oil that has been filtered through a 10 micron filter.

3 Fill the reservoir with an approved oil that has been filtered through a 10 micron filter. Leave the filler cap loose as a means of air that is trapped in the system.

4 Note on gasoline or L.P. engines: remove the coil wire and turn the engine over for 15 seconds. Diesel engines: shut off the fuel flow to the injectors and turn the engine over for 15 seconds. This procedure enables the pump to pick-up the oil before start-up. At this time disconnect the sensor line from the pump compensator and pull one of the valve spools while the engine is being turned over. This allows oil to flow through the sensor line, thus, removing any air in the sensor line. Reconnect the sensor line after a steady flow of oil is coming from the line.

5 Replace the coil wire or return the fuel flow to the injectors and start the engine. Run at low idle speed for one minute. The pump should immediately pick up oil and go into low pressure standby. If there is no indication of fill in 30 seconds, stop engine and determine the cause.

6 After the pump has stabilized in low pressure standby, operate the control valve and steering, if the system is equipped with one, to purge the system of air and to fill the cylinders with oil. Continue operating the system slowly with no load until it responds fully.

7 Check fluid level at the reservoir and refill if necessary to the proper level at the reservoir and refill if necessary to the proper level with an approved filtered oil.

8 Check all line connections for leaks tighten if necessary.

9 The machine is now ready to be put into operation.

10 Short hour filter changes are recommended for the first two changes after placing the machine back into operation. The first filter would be changed in 3-5 hours and the second at approximately 50 hours. Routine scheduled filter changes are recommended for maximum life of hydraulic system.

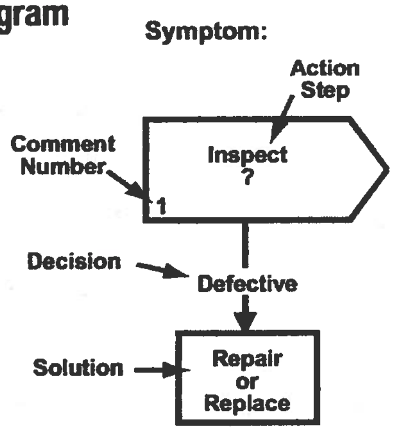
Fault - Logic Troubleshooting

This fault - logic troubleshooting guide is a diagnostic aid in locating pump problems.

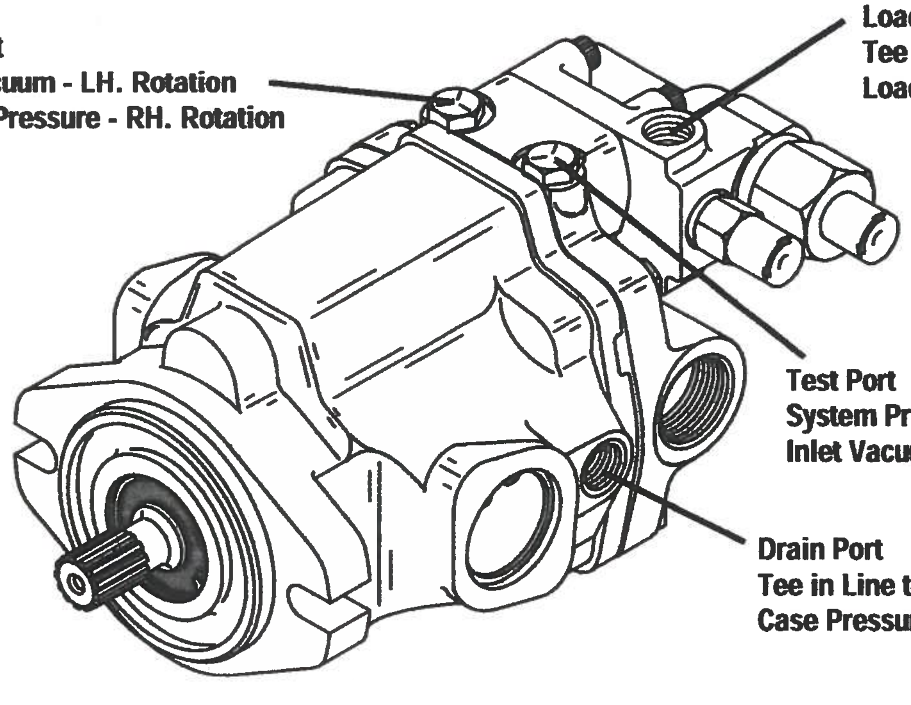
Match the pump systems with the problem statements and follow the action steps shown in the box diagrams. This will give expedient aid in correcting minor problems eliminating unnecessary machine down time.

Following the fault - logic diagrams are diagram action comments of the action steps shown in the diagrams. Where applicable, the comment number of the statement appears in the action block of the diagrams.

Explanatory Diagram



Recommended Gauge Locations

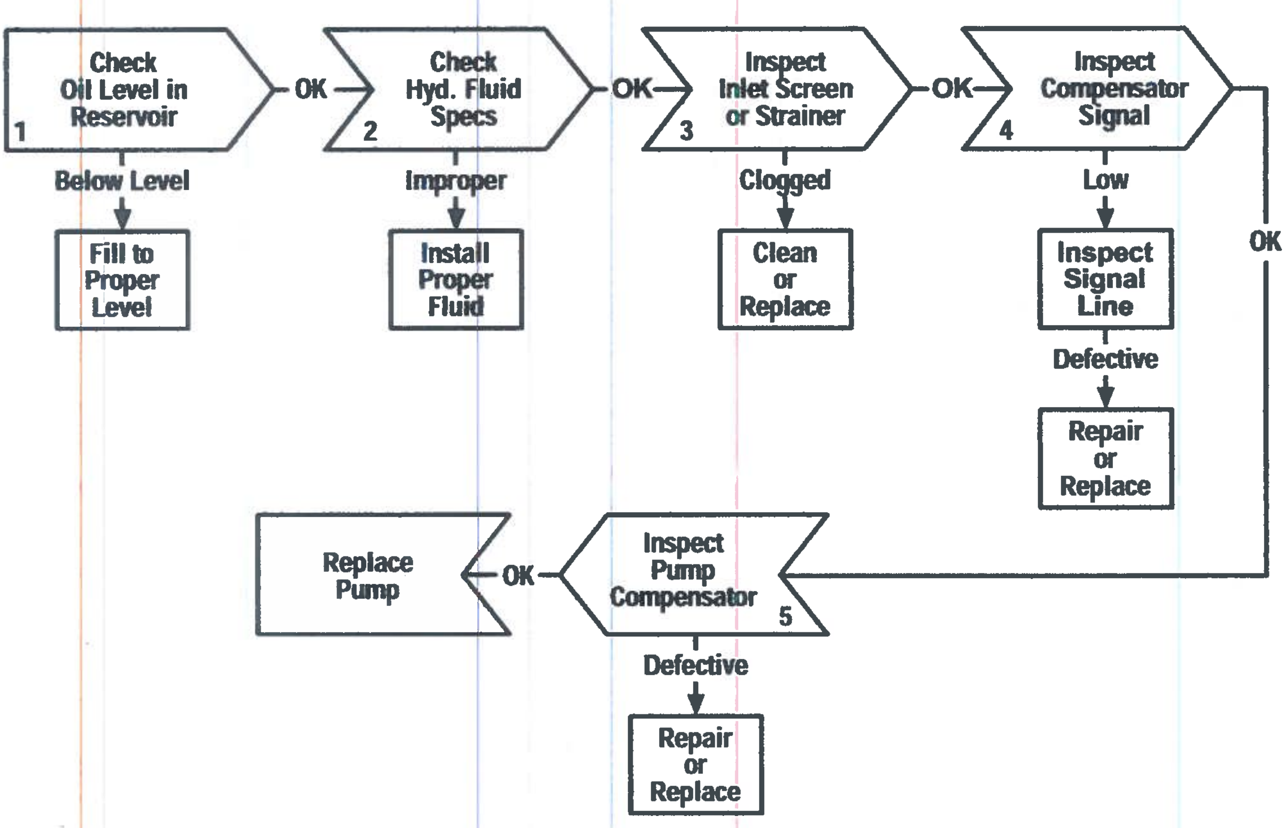


Gauges Recommended

Inlet vacuum gauge: 2 bar to 1 bar [30 PSI to 30 inHg]
System pressure gauge: 700 bar [10,000 PSI]
Case pressure gauge: 0 to 25 bar [0 to 300 PSI]

Fault - Logic Troubleshooting

Symptom:
System will not Develop Proper Pressure or Flow



Fault - Logic Troubleshooting

Symptom: Pump Noisy or Overheating

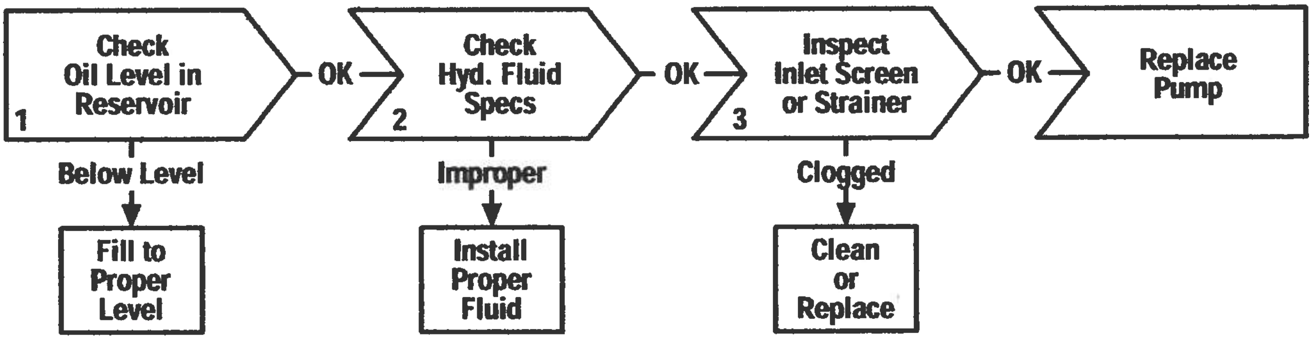


Diagram Action Step Comments

1. **Check Oil Level in Reservoir:**
   A. Fill to proper level.
2. **Check Hydraulic Fluid Specifications:**
   A. Consult owner/operators manual for the proper type fluid.
3. **Inspect Inlet Screen or Strainer for:**
   A. Suction screen or strainer plugged.
   B. Suction line to small or too long
   C. Suction line collapsed or plugged.
4. **Inspect Compensator Signal for:**
   A. Improper size or length of signal line.
   B. Damaged or obstructed signal line
5. ***Inspect Pump Compensator for:**
   A. Misadjusted pressure or flow setting.
   B. Pressure or flow spool stuck open.
   C. Pressure or flow spring weak or broken.

***Standard factory compensator pressure settings**
A. Pressure compensator set at 3000 to 3100 PSI (Optional settings of 1500 min. to 3100 max. PSI)
B. Flow compensator set at 190 to 210 PSI (Optional settings of 190 min. to 450 max. PSI)

Each order must include the following information.

1. Product and/or Part Number
2. Serial Number Code
3. Part Name
4. Quantity

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ISO-9001 CERTIFICATED FIRM

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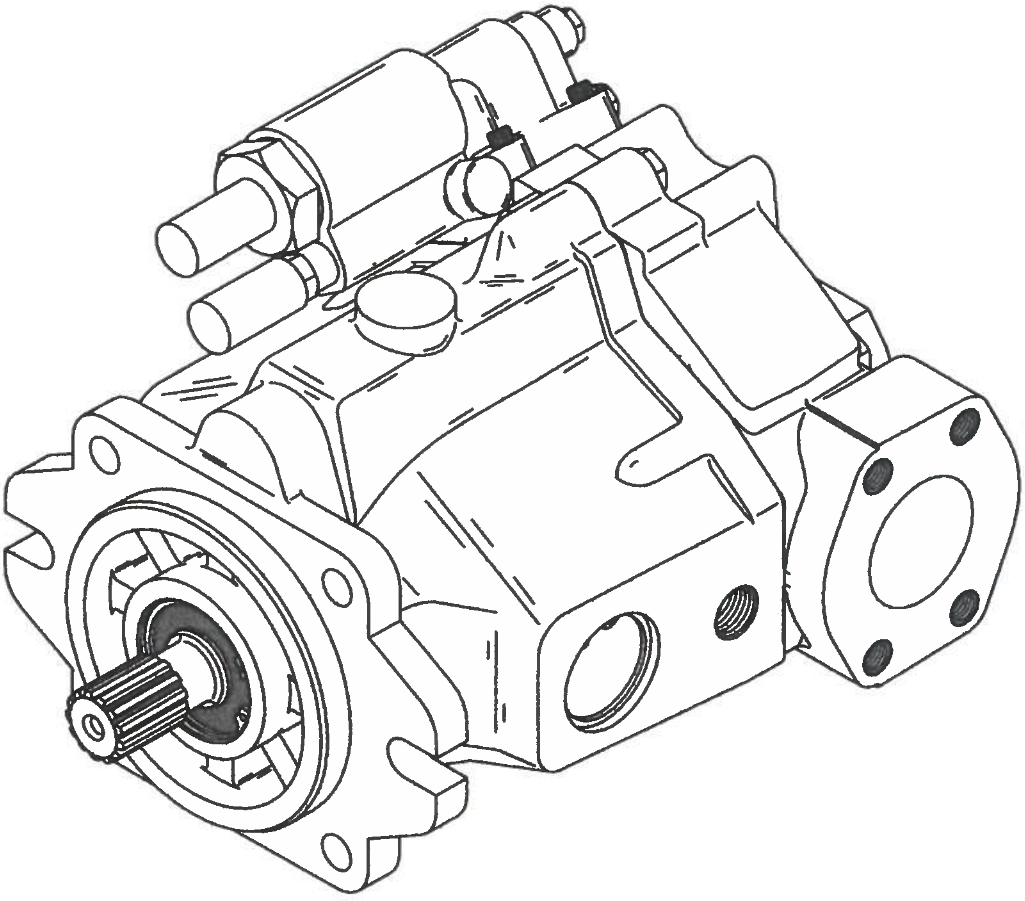
Eaton®
Medium Duty Piston Pump

No. 6-617
January 1998

Parts and Repair Information



Model 70523 or 70553, 0 -69 cm³/r [0-4.21 in³/r] Displacement
Pressure or Pressure-Flow Compensated Piston Pumps

Introduction

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Introduction

This manual provides service information for the Eaton Models 70523 Pressure or Pressure - Flow Compensated Piston Pumps. Step by step instructions for the complete disassembly, inspection, and reassembly of the pump are given. The following recommendations should be followed to insure successful repairs.

- Remove the pump from the application.
- Cleanliness is extremely important.
- Clean the port areas thoroughly before disconnecting the hydraulic lines.
- Plug the pump ports and cover the open hydraulic lines immediately after they're disconnected.
- Drain the oil and clean the exterior of the pump before making repairs.
- Wash all metal parts in clean solvent.
- Use compressed air to dry the parts. Do not wipe them dry with paper towels or cloth.
- The compressed air should be filtered and moisture free.
- Always use new seals when reassembling hydraulic pumps.
- Lubricate the new rubber seals with a petroleum jelly (Vaseline) before installation.
- Torque all bolts over gasketed joints, then repeat the torquing sequence to make-up for gasket compression.
- Verifying the accuracy of pump repairs on an authorized test stand is essential.

Identification and Tools Required

Identification Numbers - **Pressure or Pressure-Flow Compensated Piston Pump**
Stamped on each units mounting flange.

A - Product Number Description
    70523 = Single Piston Pump
    70553 = Single Piston Pump, w/ Aux. Flange
B - Rotation
    L - Left Hand (CCW)
    R - Right Hand (CW)
C - Sequential Numbering

Single Pump - Product Number:

70523 - RAA

A (70523)
B (R)
C (AA)

Serial Number Code:

B 93 01 31 JB

B - Revision level of parts list.
93 - Last two digits of year built. (93 for 1993 etc.)
01 - Month (two digits)
31 - Day of Month (two digits)
JB - Testers Initials

Serial Number Code prior to Jan., 1992:

1 B- 52- JB

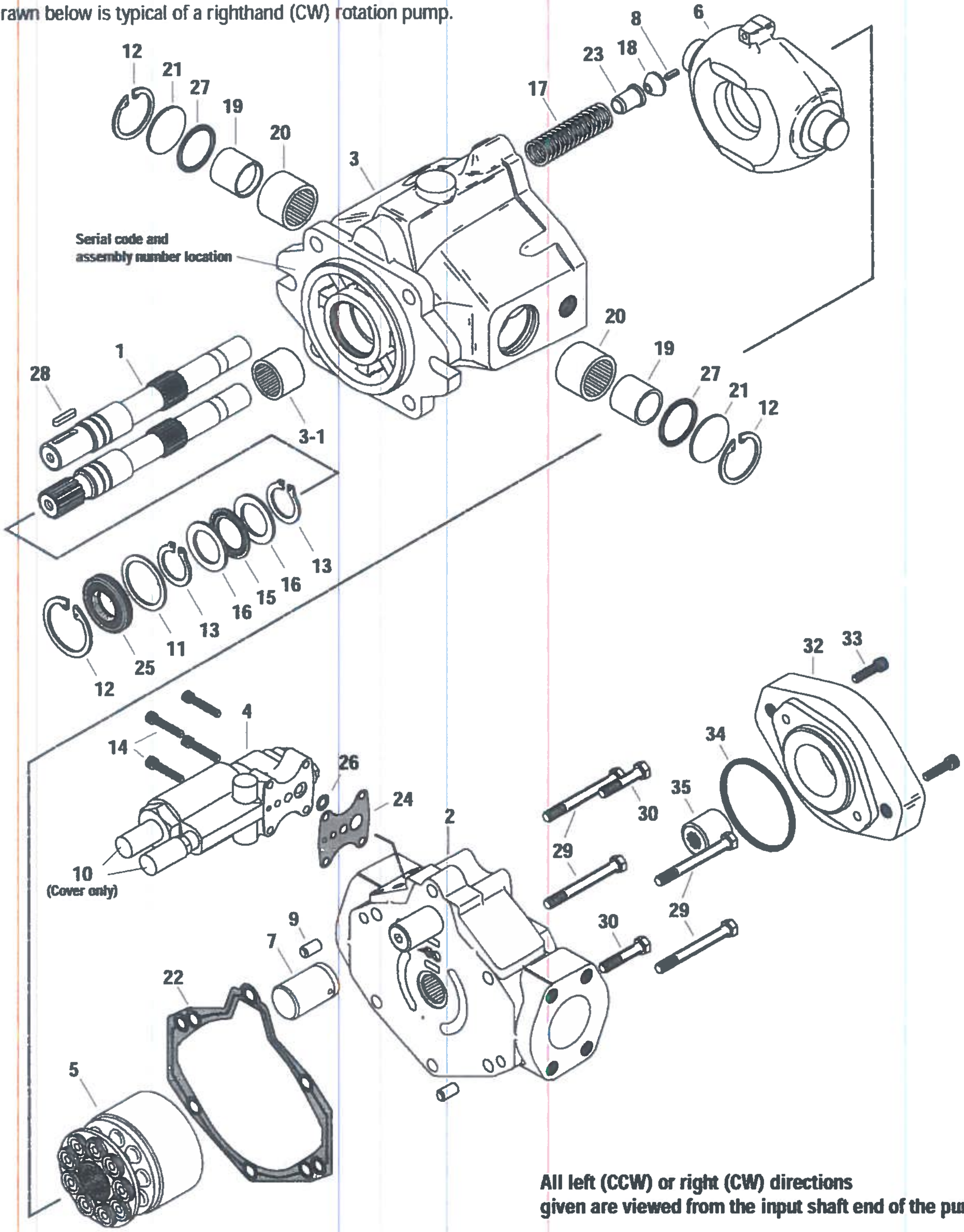
1 - Year Manufactured (1 for 1991 etc.)
B - Change Code
52 - Week of Year
JB - Testers Initials

Tools Required

- 3/8 Inch Socket
- 9/16 Inch End Wrench
- 1-1/2 Inch End Wrench
- 11/16 Inch End Wrench
- Rachet Wrench
- Torque Wrench (100 lb./ft.)
- 3/16 Inch Hex Key (Allen)
- 3/16 Inch Hex Key (Allen Socket)
- Soft Face Hammer
- Internal Retaining Pliers (Straight .070 Tip)
- External Retaining Pliers (Straight .070 Tip)
- Regular or Locking Pliers
- Seal Driver or Similar Tool
- Petroleum Jelly (Such as Vaseline)
- 1/2 inch I.D. x 1-3/8 inch O.D. flat washer (2 ea.)
- 5/8 inch I.D. x 1-3/4 inch O.D. flat washer (1 ea.)
- 1/2 inch x 4-1/2 inch N.C. Cap screw (1 ea.)
- 1/2 inch N.C. Nut

Parts Drawing

Pump drawn below is typical of a righthand (CW) rotation pump.



All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Parts List

Item	Part No.	Qty.	Description
1	◆	1	Drive Shaft (Identification drawing on page #6)
2	◆	1	Backplate Assembly (Identification drawing on page #7)
3	◆	1	Housing Assembly (Identification drawing on page #10)
3-1	77010-9	1	Bearing
4	◆	1	Compensator Assembly (Identification drawing on page #8 & 9)
5	◆	1	Rotating Kit Assembly (Parts list on page #10)
6	70523-605	1	Camplate
7	70523-423	1	Control Piston
8	16026-608	1	Roll Pin
9	16028-604	2	Dowel Pin
10	70523-618	2	Cover
11	16048-329	1	Washer
+ 12	16077-34	3	Retaining Ring
+ 13	16078-22	2	Retaining Ring
14	16147-412	4	Cap Screw
15	16241-2233	1	Thrust Bearing
16	16241-C2233	2	Thrust Bearing Race
17	17091-12	1	Spring
18	70420-35	1	Pivot Button
19	70500-100	2	Inner Race
20	70500-101	2	Thrust Bearing
21	70500-600	2	Trunnion Cover
+ 22	70500-604	1	Gasket
23	70523-400	1	Spring Collar
+ 24	70523-610	1	Gasket
+ 25	16232-22	1	Shaft Seal
25	16233-22	1	Shaft Seal, Drive (fluorocarbon rubber)
+ 26	16003-408-90	1	O-ring, 2.38 mm Dia. x 9.525 mm ID. [.0937 in. Dia. x .375 in. ID.]
+ 27	16004-3	2	O-ring, 3.175 mm Dia. x 47.625 mm ID. [.125 in. Dia. x 1.875 in. ID.]
27	16004-403	2	O-ring, 3.175 mm Dia. x 47.625 mm ID. [.125 in. Dia. x 1.875 in. ID.] (fluorocarbon)
28	16246-612	1	Key, Used on 31.75 [1.25] diameter shaft
29	16032-734	4	Cap Screw
30	16032-720	2	Cap Screw
32	70400-646	1	Mount Adapter, SAE "A" to "B" flange
33	16147-610	2	Cap Screw
34	16007-14	1	O-ring, (In K2 & K3 kit)
35	70411-617	1	Coupler, for 9 tooth spline
35	70411-604	1	Coupler, for 13 tooth spline

Mounting Kits (Drawings and parts list on Page #11)

K2	70442-929	1	Gear Pump Mounting Kit
K3	70142-915	1	Cover Plate Kit, (for "A" SAE flange)
K6	990596-000	1	Cover Plate Kit, (for "B" SAE flange)

Seal Repair Kit

•	70523-900	1	Seal Repair Kit

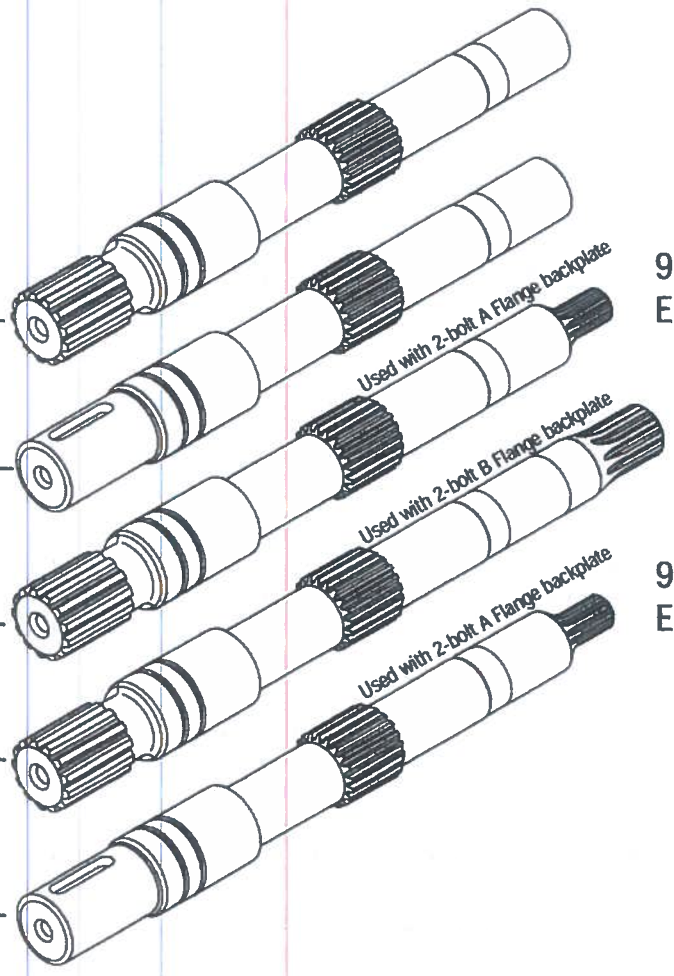
Legend		
	◆	Refer to specific item parts list.
	+	Included in seal repair kits listed.

Item 1 - Drive Shaft Identification

Item 1

Drive Shaft Identification

Part Number **Input Drive** **Output Drive**


Used with 2-bolt A Flange backplate
Used with 2-bolt B Flange backplate
Used with 2-bolt A Flange backplate

70502-200, 14 Tooth

70502-202,
31.8 [1.25] Dia. Keyed

70552-200, 14 Tooth

70552-203, 14 Tooth

70552-209,
31.8 [1.25] Dia. Keyed

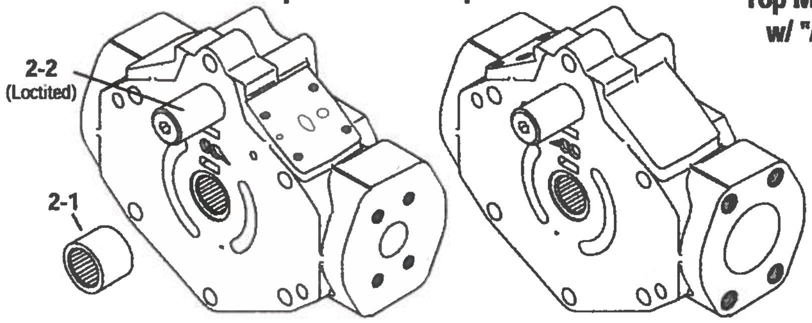
9 Tooth
External

13 Tooth
External

9 Tooth
External

Item 2 - Backplate Assembly

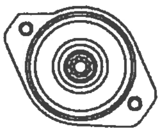
2(a)
Top Mounted Compensator



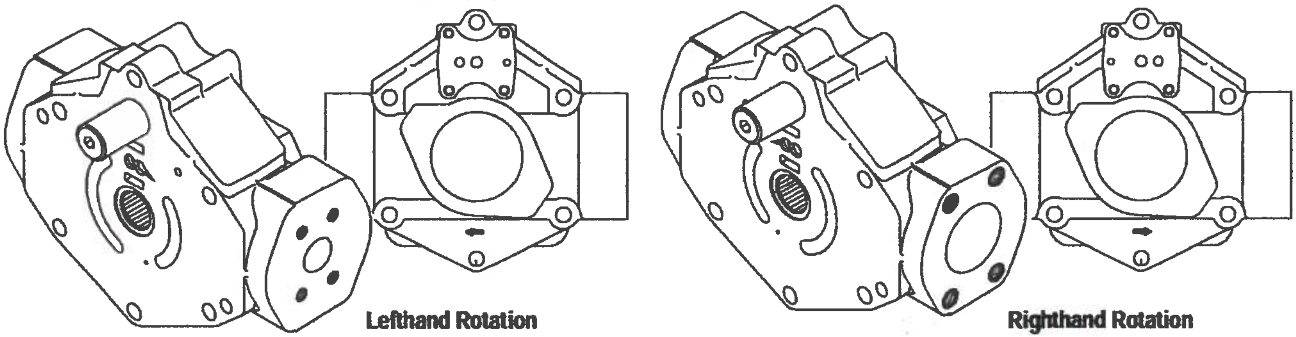
Lefthand Rotation
(CCW)

Righthand Rotation
(CW)

2(c)
Top Mounted Compensator
w/ "A" SAE Aux. Flange



2(b) Rear Mounted Compensator



Lefthand Rotation
(CCW)

Righthand Rotation
(CW)

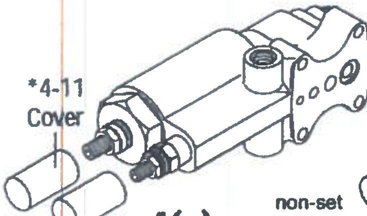
Item 2 - Parts List

Item	Lefthand Rotation Part No.	Righthand Rotation Part No.	Qty.	Description
2(a)	70523-301	70523-305	1	Opposite Side Porting, Top Mounted Compensator Backplate Assembly
2(b)	----	70523-341	1	Opposite Side Porting, Rear Mounted Compensator Backplate Assembly
2(c)	70553-305	70553-303	1	Auxiliary 2-Bolt A Flange Series 82-2, Opposite Side Porting Backplate
2-1	16237-11816		1	Bearing
2-2	70523-614		1	Guide Pin

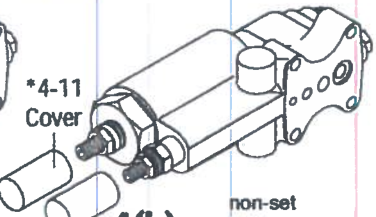
All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Item 4 - Compensator Assembly

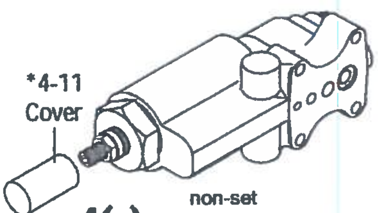
Pressure-Flow Compensator **Pressure Compensator**



4(a) 70523-FW
Lefthand (CCW) **Pump Rotation**

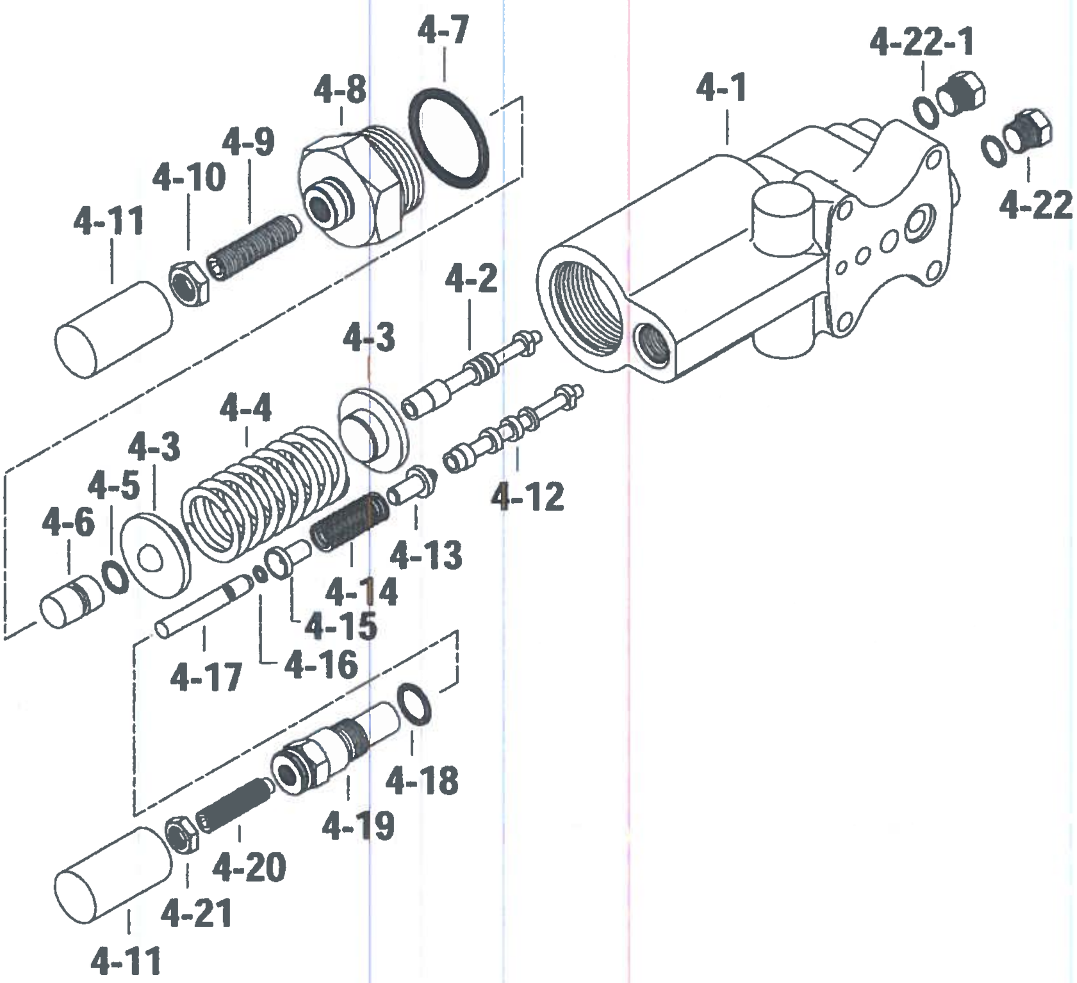


4(b) 70523-FU
Righthand (CW) **Pump Rotation**



4(c) 70523-FT
For Both Pump Rotations

*4-11, Cover not included with non-set compensator assy.



Item 4 - Compensator Parts List

Item 4 - Parts List (Refer to drawings)

	Item	Part No.	Qty.	Description
	4(a)	70523-FW	1	Non-Set Pressure-Flow Compensator Assembly, Lefthand Rotation
	4(b)	70523-FU	1	Non-Set Pressure-Flow Compensator Assembly, Righthand Rotation
	4(c)	70523-FT	1	Non-Set Pressure Compensator Assembly
	4-1	N/S	1	Compensator Body
	4-2	N/S	1	Pressure Spool
	4-3	70523-501	2	Spring Pivot
	4-4	17122-8	1	Spring
+	**4-5**	16003-7-90	1	O-ring, 1.588 mm Dia. x 8.26 mm I.D. [.0625 in. Dia. x .375 in. I.D.]
	4-6	70500-628	1	Pressure Rod
+	**4-7**	16015-24	1	O-ring, 2.38 mm Dia. x 31.75 mm I.D. [.0937 in. Dia. x 1.25 in. I.D.]
	4-8	70500-627	1	Adjustment Cap, Pressure
	4-9	16138-624	1	Set Screw
	4-10	16024-6	1	Nut
	4-11*	70523-618*	1or2	Cover*
	4-12	N/S	1	Flow Spool
	4-13	70500-605	1	Spring Pivot
	4-14	17046-12	1	Spring
	4-15	70500-629	1	Spring Pivot
+	**4-16**	16003-1	1	O-ring, 1.59 mm Dia. x 3.175 mm I.D. [.0625 in. Dia. x .125 in. I.D.]
	4-17	70500-631	1	Pressure Rod
+	**4-18**	16133-6	1	O-ring, 1.98 mm Dia. x 11.89 mm I.D. [.078 in. Dia. x .468 in. I.D.]
	4-19	70500-630	1	Adjustment Cap, Flow
	4-20	16139-516	1	Set Screw
	4-21	16024-5	1	Nut
	4-22	16103-104	2	Plug Assembly
+	**4-22-1**	16133-4	2	O-ring, 1.83 mm Dia. x 8.92 mm I.D. [.072 in. Dia. x .351 in. I.D.]

Legend
+ Included in seal repair kit listed on page 5.
NSS Not Sold Separately

* Covers are not included with Non-Set Compensator

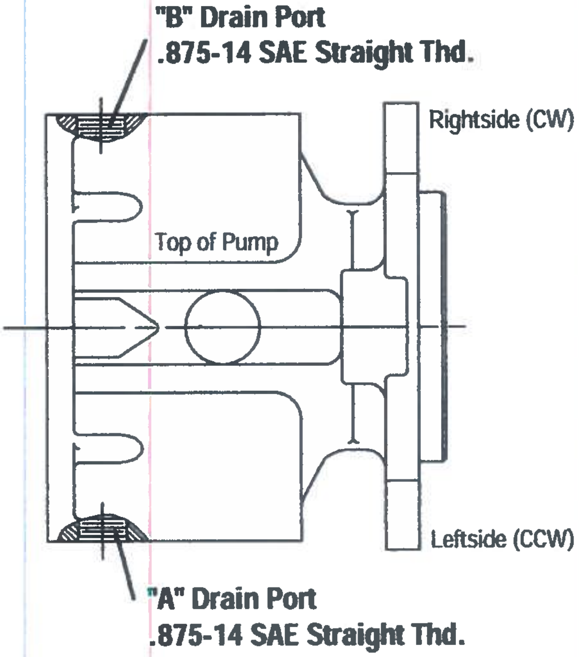
Pre-set Pressure-Flow Compensator Assemblies

Non-Set Assembly	Pre-set Assembly	Pump Rotation	Pressure Setting	Flow Setting
70523-FU	**70523-DS-01**	Righthand (CW)	176±3.5 bar [2550±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70523-FU	**70523-EL-01**	Righthand (CW)	193±3.5 bar [2800±50 lbf/in^2]	19.3±0.7 bar [280±10 lbf/in^2]
70523-FU	**70523-EW-01**	Righthand (CW)	155±3.5 bar [2250±50 lbf/in^2]	5.68±1.2 bar [82.5±17.5 lbf/in^2]
70523-FU	**70523-FA-01**	Righthand (CW)	193±3.5 bar [2800±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70523-FU	**70523-FG-01**	Righthand (CW)	210±3.5 bar [3050±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70523-FU	**70523-FL-01**	Righthand (CW)	193±3.5 bar [2800±50 lbf/in^2]	15.8±0.7 bar [230±10 lbf/in^2]
70523-FW	**70523-FH-02**	Lefthand (CCW)	210±3.5 bar [3050±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70523-FW	**70523-FM-02**	Lefthand (CCW)	134±3.5 bar [1950±50 lbf/in^2]	21.7±0.7 bar [315±10 lbf/in^2]

Pre-set Pressure Compensator Assembly

Non-Set Assembly	Pre-set Assembly	Pump Rotation	Pressure Setting
70523-FT	**70523-FJ-03**	Both	210±3.5 bar [3050±50 lbf/in^2]

Item 3 - Housing Identification
Item 5 - Rotating Kit Assembly



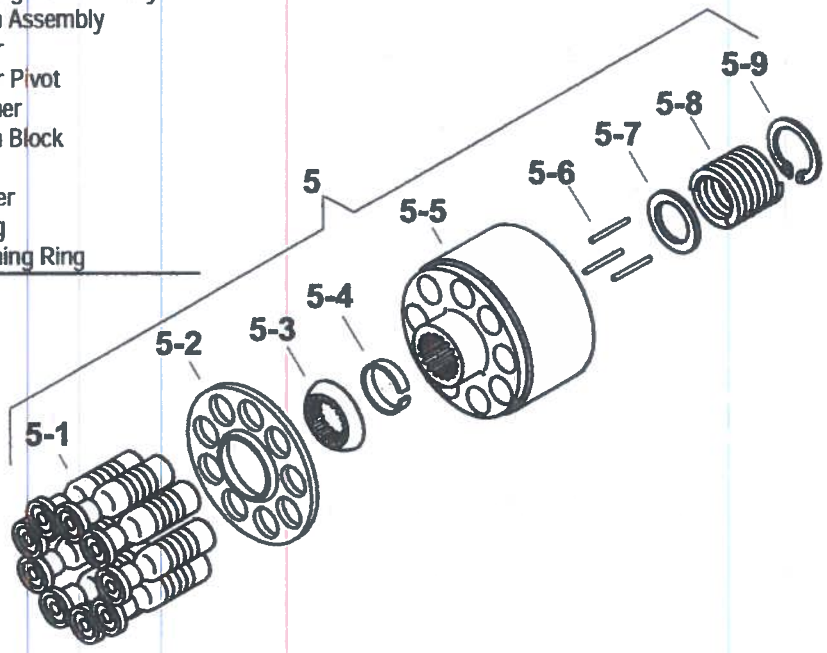
Item 3
Housing Identification

Item	Part No.	Port Machined
3	70500-303	B
	70500-311	A
	70500-332	A, B

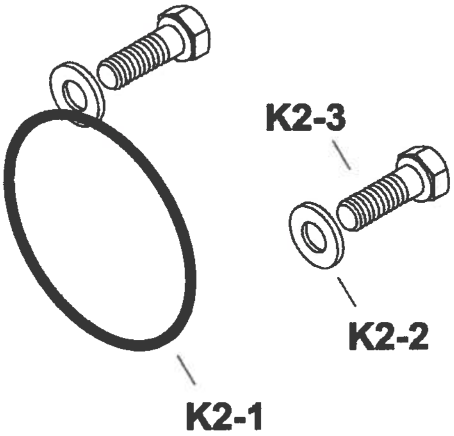
Item 5
Rotating Kit Assembly

Item	Part No.	Qty.	Description
5	70502-606	1	Rotating Kit Assembly
5-1	NSS	9	Piston Assembly
5-2	NSS	1	Spider
5-3	NSS	1	Spider Pivot
5-4	NSS	1	Retainer
5-5	NSS	1	Piston Block
5-6	NSS	3	Pins
5-7	NSS	1	Washer
5-8	NSS	1	Spring
5-9	NSS	1	Retaining Ring

NSS - Not Sold Separately



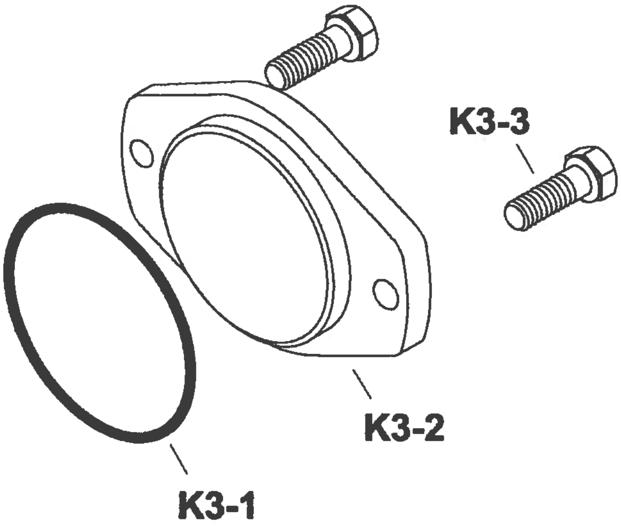
Mounting Kits



Kit 2, Gear Pump Mounting

(To Mount "A" SAE flanges)

Item	Part No.	Qty.	Description
K2	70442-929	1	Gear Pump Mounting Kit
K2-1	16007-14	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K2-2	16048-113	2	Washer
K2-3	16032-612	2	Cap Screws



Kit 3 & 6, Cover Plates

For "A" SAE Flanges

Item	Part No.	Qty.	Description
K3	70142-915	1	Cover Plate Kit for "A" SAE flange
K3-1	16007-14	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K3-2	70142-600	1	Cover Plate
K3-3	16032-610	2	Cap Screws

For "B" SAE Flanges (Not Pictured)

Item	Part No.	Qty.	Description
K6	990596-000	1	Cover Plate Kit for "B" SAE flange
K6-1	102919-000	1	Gasket
K6-2	250073-000	1	Cover Plate
K6-3	95865-100	2	Cap Screws
K6-4	101896-050	2	Lock Washer

Product Number

This list of product numbers is to aid in Item identification.
If your product number is not listed contact your Eaton representitive.

Model 70523, Lefthand Rotation (CCW)

Product Number	Description of Part Number Drive Shaft Item #1	Backplate Assy. Item #2	Housing Assy. Item #3	Compensator Assy. Item #4
70523-LAA	70502-200	70523-301	70500-303	70523-FJ-03
70523-LAB	70502-200	70523-301	70500-303	70523-FH-02
70523-LBF	70502-202	70523-301	70500-303	70523-FH-02
70523-LBG	70502-202	70523-301	70500-303	70523-FJ-03
70553-LAB	70552-200	70553-305	70500-303	70523-FH-02
70553-LAK	70552-209	70553-305	70500-303	70523-FH-02
70553-LAR	70552-203	70553-305	70500-303	70523-FH-02

Model 70523, Righthand Rotation (CW)

Product Number	Description of Part Number Drive Shaft Item #1	Backplate Assy. Item #2	Housing Assy. Item #3	Compensator Assy. Item #4
70523-RAA	70502-200	70523-305	70500-303	70523-FJ-03
70523-RAB	70502-200	70523-305	70500-303	70523-FG-01
70523-RBE	70502-202	70523-305	70500-303	70523-FJ-03
70553-RAB	70552-200	70553-303	70500-303	70523-FG-01
70553-RAK	70552-209	70553-303	70500-303	70523-FG-01

All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Repair Information

Cleanliness is extremely important when repairing these pumps. Work in a clean area. Before disconnecting the lines clean port area of pump. Disconnect hydraulic lines and remove pump assembly from vehicle and plug ports. Thoroughly clean the outside of pump. After cleaning, remove port plugs and drain oil.

Disassembly

ATTENTION: Removal of the adjusting screw covers from cap may void the warranty on this assembly.

1 Clamp the end of the drive shaft in a protected jaw vise with the body of the pump up and remove the four allen head screws (14) holding compensator (4).

2 Remove the compensator assembly (4), 0-ring (26), and gasket (24).

3 Remove the six cap screws (29, four ea. and 30, two ea.) from the backplate of the pump.

4 Use a soft mallet to loosen backplate. Remove backplate (2) and gasket (22) from housing.

5 Remove the control piston (7) remaining on the backplate or in housing.

6 To remove rotating assembly (5) from housing, remove pump from vise and slide rotating assembly off shaft. Caution: pistons may not come out with piston block.

7 Remove pistons (5-1), spider (5-2), and spider pivot (5-3) from piston block (5-5).

8 The piston block assembly (5-5) need not be disassembled unless the internal pins (5-6) or spring (5-8) are damaged.

CAUTION: Use the following procedure if the spring is to be removed from the piston block. The spring (5-8) is highly compressed and the snap ring (5-9) should not be removed without compressing the spring.

The following parts will be needed to disassemble the piston block:

2 ea. 1/2 I.D. x 1-3/8 O.D. flat washer,
1 ea. 5/8 x 1-3/4 flat washer, and
1 ea. 1/2 x 4-1/2 in. N.C. cap screw
1 ea. 1/2 N.C. nut.

Place one of the flat washers over the 1/2 x 4-1/2 in. cap screw and place this through the center of the piston block. Place the 5/8 washer over the cap screw and let it rest on the three pins. Place the other 1/2 in. flat washer on the cap screw and screw the nut on and compress the spring inside the piston block. Use a pair of snap ring pliers and remove the internal snap ring (5-9). Remove the nut and bolt along with the two washers (5-7), three pins (5-6), and the internal pin keeper (5-4).

9 To free shaft seal and shaft, remove retaining ring (12).

10 Remove shaft (1) from housing (3) by tapping backplate end of shaft with a wooden or plastic mallet.

11 Remove shaft seal (25), washer (11), the two retaining rings (13), the two thrust washers (16), and bearing (15) from shaft.

12 To remove the camplate (6) from the housing, remove the two internal retaining rings (12) from the sides of the housing. Remove the two covers (21), the two o-rings (27), the two inner races (19), and the bearings (20). The camplate can now be moved over to one side and removed. The two camplate pivot bearings are a loose slip fit into the housing. Do not be concerned if they are not tight.

13 Remove the spring collar (23) and spring (17). Do not remove the button (18) and roll pin (8) unless they are worn or loose.

14 The pressure-flow compensator assembly (4) may be disassembled for cleaning and inspection.

ATTENTION: Removal of the adjusting screw covers

Repair Information

from cap may void the warranty on this assembly.

15 Remove pressure adjustment cap (4-8) from compensator housing (4-1). Pressure rod (4-6) will remain in cap (4-8), pull rod from cap.

16 Remove flow adjustment cap (4-19) from compensator housing (4-1). Pressure rod (4-17) will remain in cap (4-19). Pull rod from cap.

17 Remove springs (4-4 and 4-14) and spring pivots (4-3, 4-13 and 4-15) from compensator housing.

18 Remove plugs (4-22), pressure compensator spool (4-2), and flow compensator spool (4-12) from compensator housing (4-1).

19 The shaft seal, all O-rings, and all gaskets should be removed and replaced with new items upon reassembly.

Inspect Parts For Wear

1 Inspect the flat surface of the backplate (2), the finish on the piston block side should be smooth and free of grooves. The piston guide should be tight in the backplate. The needle bearing in the backplate should be free of excessive play and remain in the bearing cage. If the backplate has any of the wear characteristics outlined above, replace complete backplate assembly.

2 Inspect the piston block (5). The surface that contacts the backplate should be smooth and free of grooves.

3 The pistons (5-1) should move freely in the piston block bore. If they stick in the bore, examine the bore for scoring or contamination.

4 Examine the O.D. of the piston (5-1) for finish condition. They should not show wear or deep scratches. The shoes should be a snug fit on the ball end of the piston. The flat surface of the shoes should be flat, and smooth. Do not lap piston shoes.

5 Examine the spider (5-2). It should be flat, no cracks, and no signs of wear in the pivot area.

6 Examine the pivot (5-3). It should be smooth and show no signs of wear.

7 Inspect the camplate (6) for the condition of finish of the polished shoe surface. It should show no signs of scoring.

8 Inspect shaft (1) for wear in bearing and spline areas.

9 Inspect thrust bearing (15) and thrust washers (16) for wear.

10 Inspect the needle bearing in the housing assembly (3). If the needles are free of excessive play and remain in the bearing cage, there is no need to replace the housing.

11 Inspect the compensator springs (4-4 and 4-14) for breakage or weakness.

12 Inspect the spools (4-2 and 4-12) for scoring.

13 It is not necessary to inspect the o-rings, retaining rings, gaskets, or shaft seal as they should be replaced as new items and are included in the seal repair kit available for this assembly.

Reassembly

1 Clean all parts in suitable solvent; lubricate all critical moving parts before reassembly.

2 Install camplate control spring (17) and spring collar (23) in housing (3).

3 Insert camplate (6) into housing (3). Insert needle bearings (20) and bearing inner race (19) over the camplate arms and slide into housing (3). The numbered end of the bearing should face outward and the chamfered I.D. of the race should face inward.

4 Install new O-ring (27) around O.D. of camplate

Repair Information

pivot bearing (20). Install trunnion covers (21) and secure with retaining rings (12).

5 Install retaining ring (13) on shaft (1). Install thrust washer (16), thrust bearing (15), and second thrust washer (16). Secure with second retaining ring (13).

6 Install shaft (1) in housing (3) and install washer (11), shaft seal (25), and retain with retaining ring (12). Make sure retaining ring is seated in the groove.

7 If piston block assembly was disassembled, compress the pin keeper (5-4), and install in the spline area of piston block. Install the three pins (5-6) into the special grooves of the piston block spline.

8 Install the washer (5-7), spring (5-8), into the piston block. Use the three washers and the 1/2 x 4-1/2 in. cap screw to compress the spring and retain with retaining ring (5-9). Remove the cap screw and the three washers.

9 Install the pivot (5-3), spider (5-2), and piston assemblies (5-1) in the piston block. Install this assembly in the housing assembly, the piston shoes must be in contact with the camplate. Be sure all the parts are in their proper position.

10 Clamp this assembly in a protected jaw vise with the open end of the housing (3) up.

11 Install new gasket (22).

12 Install control piston (7), and plug (2-2) with new o-ring onto backplate. Note roll pin (3-2) locations.

13 Install backplate (2) and retain with cap screws (29 and 30). Torque to 47 to 54 N-m [35 to 40 lb-ft].

14 Place new o-ring (4-22-1) on plug (4-22). Install plug assembly, flow compensator spool (4-12), spring pivot (4-13), spring (4-14), spring pivot (4-150, pressure rod (4-17) with new O-ring (4-16), and flow adjustment cap (4-19) with new O-ring (4-18) into compensator housing (4-1). Torque plug (4-22) 8 to 11 N-m [6 to 8 lb-ft] and torque flow adjustment cap (4-19) 14 to 16 N-m [10 to 12 lb-ft].

15 Place new o-ring (4-22-1) on plug (4-22). Install plug assembly, pressure compensator spool (4-2), spring pivot (4-3), spring (4-4), second spring pivot (4-3), pressure rod (4-6) with new o-ring (4-5), and pressure adjustment cap (4-8) with new o-ring (4-7) into compensator housing (4-1). Torque plug (4-22) 8 to 10 N-m [6 to 8 lb-ft] and torque pressure adjustment cap (4-8) 47 to 54 N-m [35 to 40 lb-ft] .

16 Install new gasket (24) and new o-ring (26), then install compensator assembly (4),and retain with four allen head cap screws (14) and torque to 14 to 16 N-m [10 to 12 lb-ft].

17 Plug ports to preserve cleanliness until installation on vehicle. (Refer to start up procedures.)

Start-up Procedure

When initially starting a rebuilt load sensing system, it is extremely important that the start-up procedure be followed. It prevents the chance of damaging the pump which might occur if the system was not properly purged with oil before start-up.

1 After the pump has been properly installed onto the machine and all hydraulic connections have been made, check all fittings to make sure that they are tight.

2 Fill the pump housing at least 1/2 full with system oil that has been filtered through a 10 micron filter.

3 Fill the reservoir with an approved oil that has been filtered through a 10 micron filter. Leave the filler cap loose as a means of air that is trapped in the system.

4 Note on gasoline or L.P. engines: remove the coil wire and turn the engine over for 15 seconds. Diesel engines: shut off the fuel flow to the injectors and turn the engine over for 15 seconds. This procedure enables the pump to pick-up the oil before start-up. At this time disconnect the sensor line from the pump compensator and pull one of the valve spools while the engine is being turned over. This allows oil to flow through the sensor line, thus, removing any air in the sensor line. Reconnect the sensor line after a steady flow of oil is coming from the line.

5 Replace the coil wire or return the fuel flow to the injectors and start the engine. Run at low idle speed for one minute. The pump should immediately pick up oil and go into low pressure standby. If there is no indication of fill in 30 seconds, stop engine and determine the cause.

6 After the pump has stabilized in low pressure standby, operate the control valve and steering, if the system is equipped with one, to purge the system of air and to fill the cylinders with oil. Continue operating the system slowly with no load until it responds fully.

7 Check fluid level at the reservoir and refill if necessary to the proper level at the reservoir and refill if necessary to the proper level with an approved filtered oil.

8 Check all line connections for leaks tighten if necessary.

9 The machine is now ready to be put into operation.

10 Short hour filter changes are recommended for the first two changes after placing the machine back into operation. The first filter would be changed in 3-5 hours and the second at approximately 50 hours. Routine scheduled filter changes are recommended for maximum life of hydraulic system.

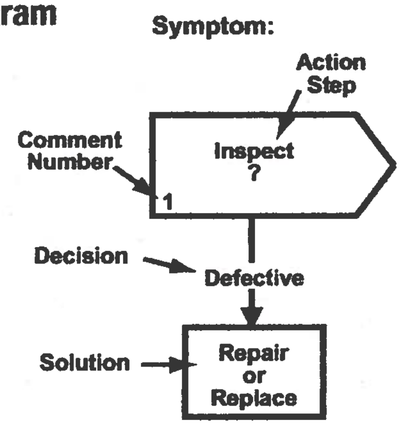
Fault - Logic Troubleshooting

This fault - logic troubleshooting guide is a diagnostic aid in locating pump problems.

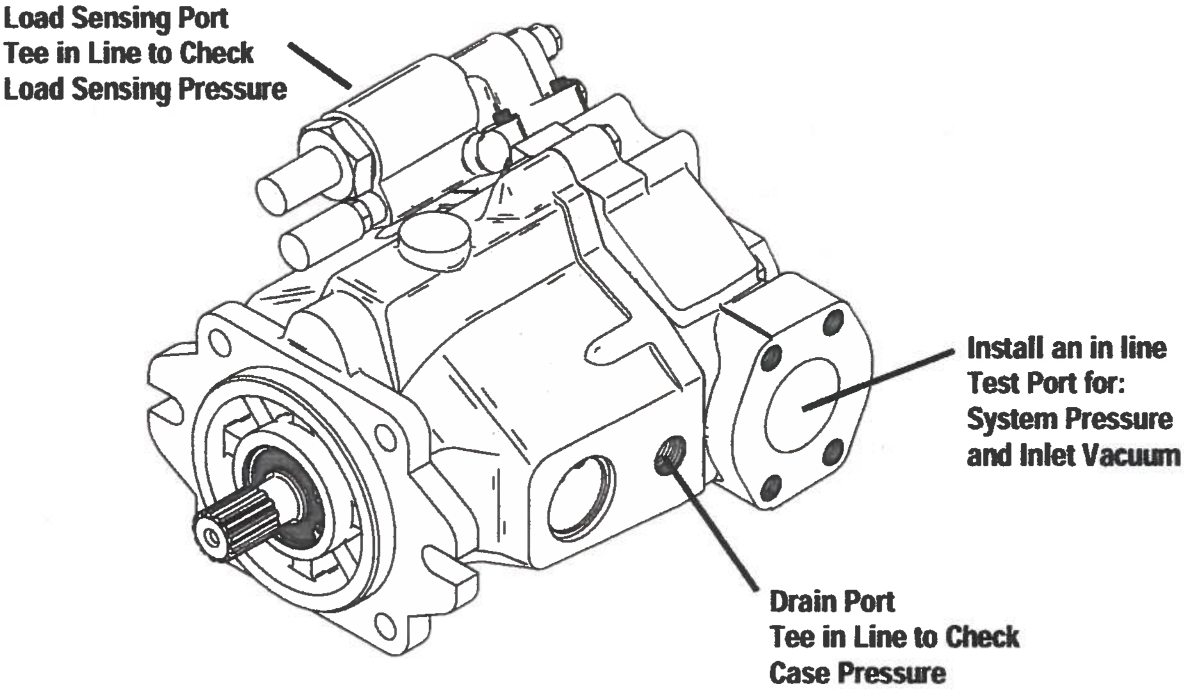
Match the pump systems with the problem statements and follow the action steps shown in the box diagrams. This will give expedient aid in correcting minor problems eliminating unnecessary machine down time.

Following the fault - logic diagrams are diagram action comments of the action steps shown in the diagrams. Where applicable, the comment number of the statement appears in the action block of the diagrams.

Explanatory Diagram



Recommended Gauge Locations

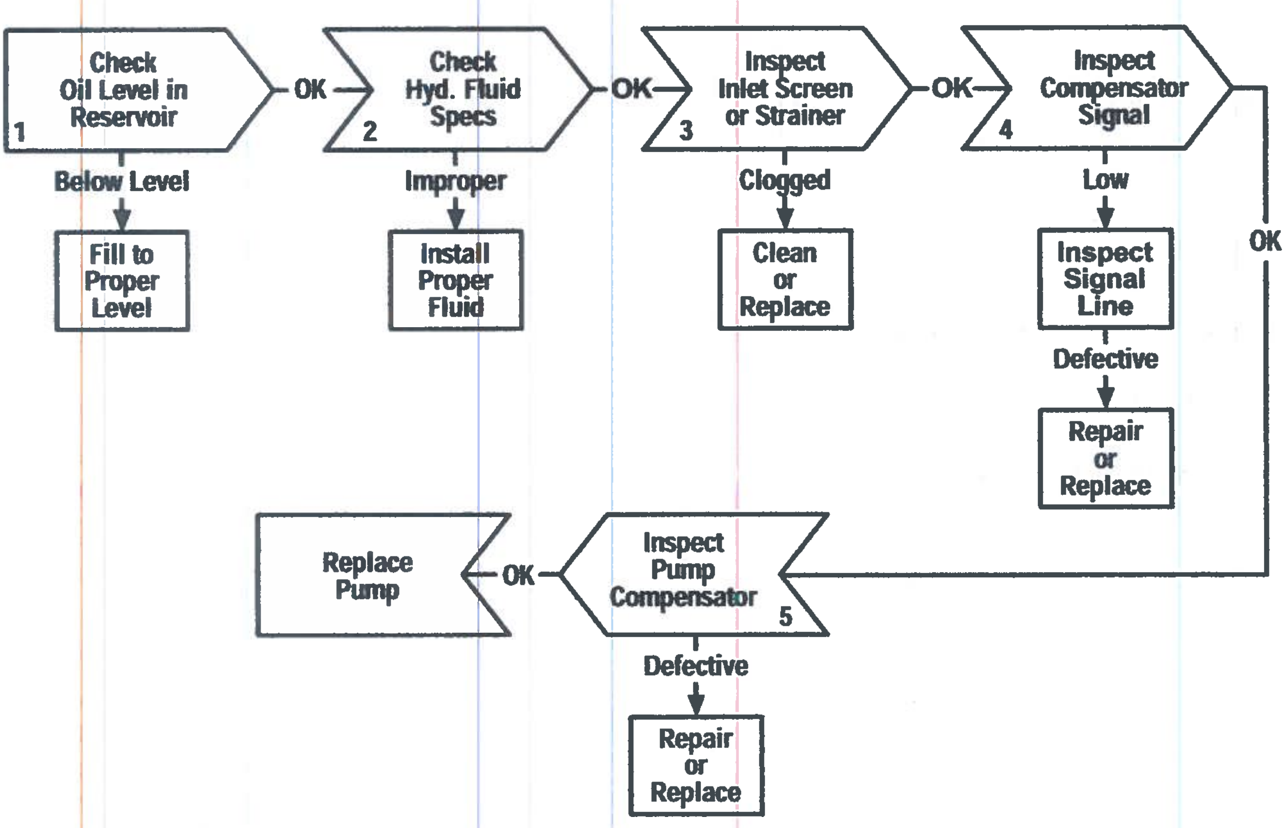

Load Sensing Port Tee in Line to Check Load Sensing Pressure
Install an in line Test Port for: System Pressure and Inlet Vacuum
Drain Port Tee in Line to Check Case Pressure

Gauges Recommended

Inlet vacuum gauge: 2 bar to 1 bar [30 PSI to 30 inHg]
System pressure gauge: 700 bar [10,000 PSI]
Case pressure gauge: 0 to 25 bar [0 to 300 PSI]

Fault - Logic Troubleshooting

Symptom:
System will not Develop Proper Pressure or Flow



Fault - Logic Troubleshooting

Symptom: Pump Noisy or Overheating

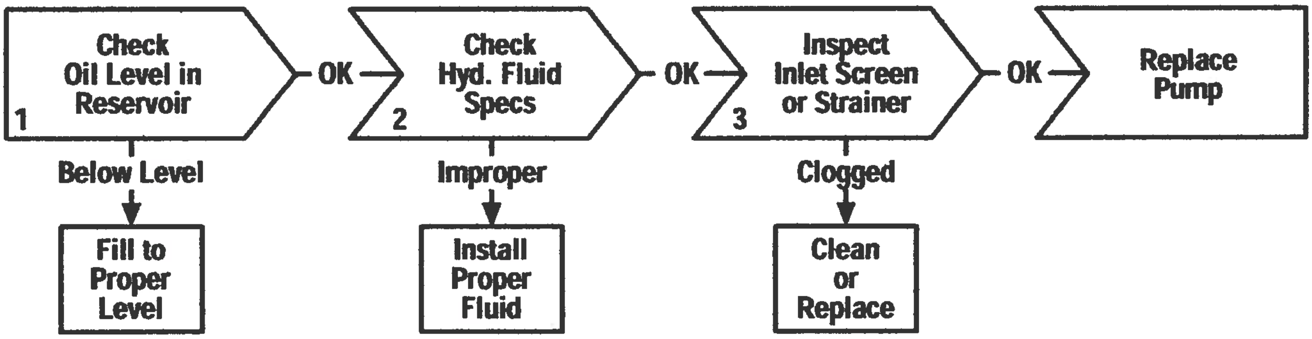


Diagram Action Step Comments

1. **Check Oil Level in Reservoir:**
   A. Fill to proper level.
2. **Check Hydraulic Fluid Specifications:**
   A. Consult owner/operators manual for the proper type fluid.
3. **Inspect Inlet Screen or Strainer for:**
   A. Suction screen or strainer plugged.
   B. Suction line to small or too long
   C. Suction line collapsed or plugged.
4. **Inspect Compensator Signal for:**
   A. Improper size or length of signal line.
   B. Damaged or obstructed signal line
5. ***Inspect Pump Compensator for:**
   A. Misadjusted pressure or flow setting.
   B. Pressure or flow spool stuck open.
   C. Pressure or flow spring weak or broken.

***Standard factory compensator pressure settings**

A. Pressure compensator set at 3000 to 3100 PSI (Optional settings of 1500 min. to 3100 max. PSI)

B. Flow compensator set at 190 to 210 PSI (Optional settings of 190 min. to 450 max. PSI)

Each order must include the following information.

1. Product and/or Part Number
2. Serial Number Code
3. Part Name
4. Quantity

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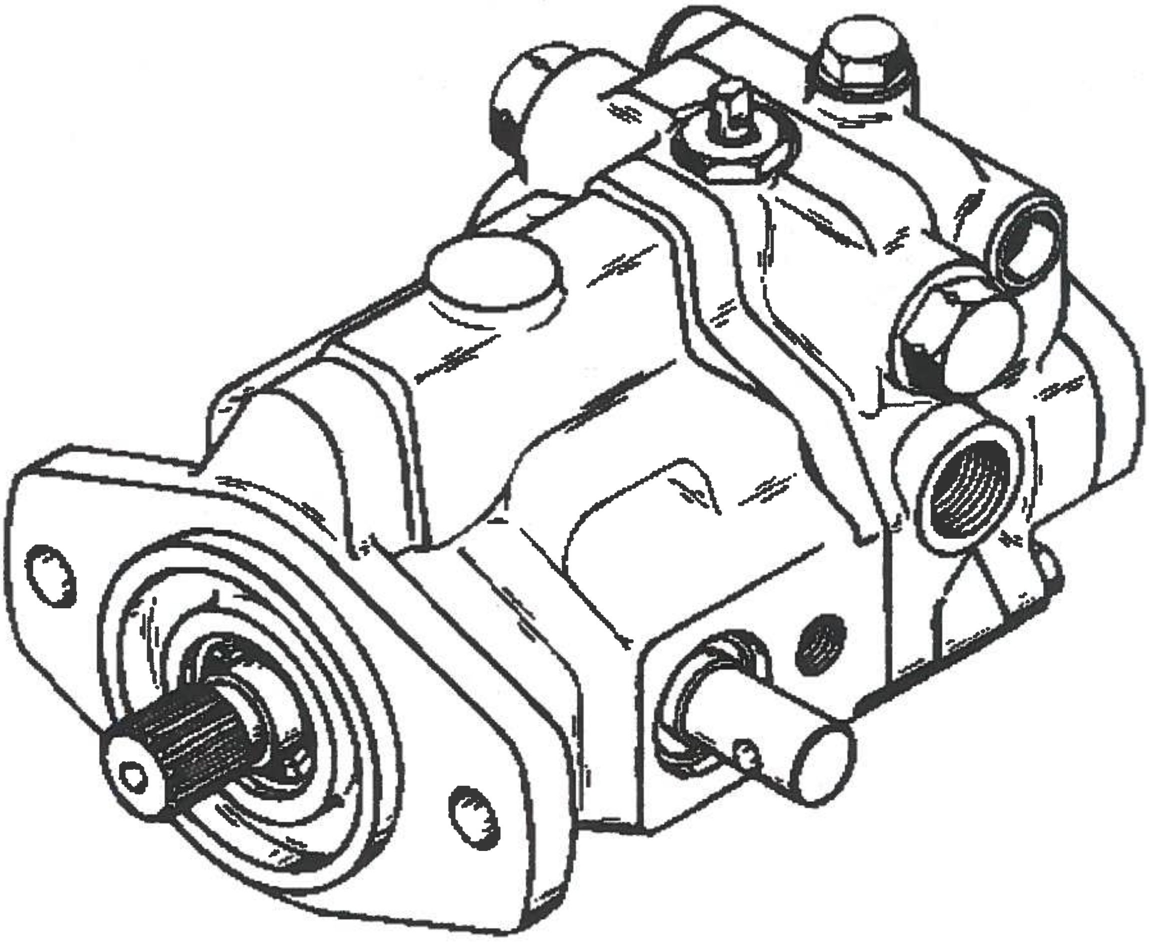
Eaton
Hydraulics
Division

Parts Information

Model 70442 Propulsion Piston Pump



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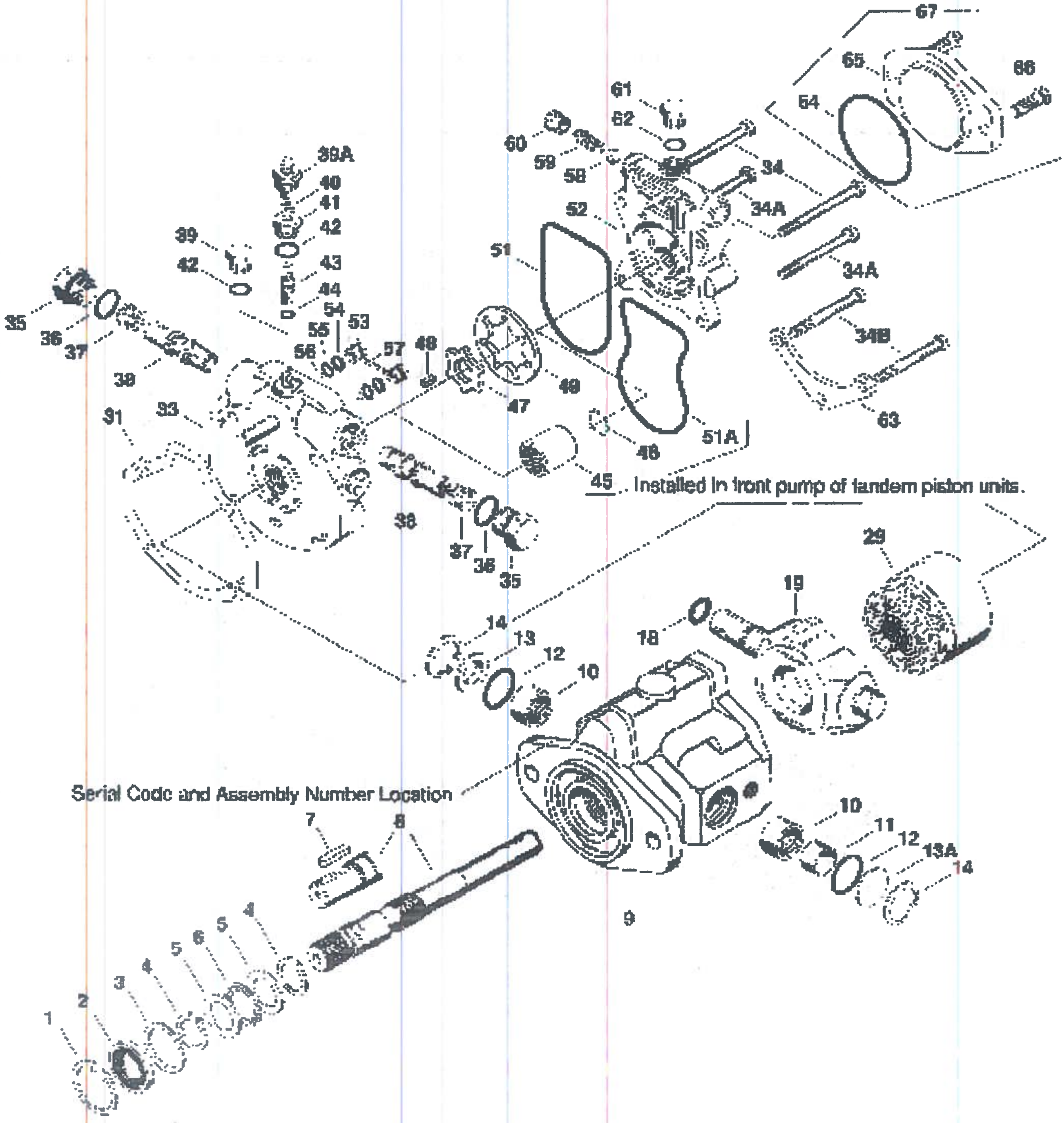
PARTS DRAWING



45 .. Installed in front pump of tandem piston units.

Serial Code and Assembly Number Location

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	Item No.	Description	Quantity	Model 70442
+	1	Retaining Ring	1	16077-32
+	2	Shaft Seal	1	16253-18
	3	Washer	1	16048-319
+	4	Retaining Ring	2	16078-18
	5	Bearing Race	2	74308-100
	6	Bearing	1	74308-101
	7	Key	1	16246 516
	8	Drive Shaft	1	◆
	9	Housing Assembly	1	70402-324
	10	Bearing	2	70412-151
	11	Inner Race	1	70402-100
+	12	O-ring, 3/32 n. x 1-7/16 in. I.D.[2,38mm x 36,5mm I.D.]	2	16015-27
	13	Sleeve Cover	1	70402-600
	13A	Trunnion Cover	1	70412-607
–	14	Retaining Ring	2	16077-26
–	18	O-ring,3/32 in. x 13/16 in. I.D.[2,38mm x 20,64mm I.D.]	1	16015-217
	19	Camplate	1	◆
	29	Rotating Kit Assembly	1	70402-615
–	31	Housing Gasket	1	70412-626
	33	Backplate Assembly	1	◆
	34	Cap Screws	2	16032-640
	34A	Cap Screws	2	16032-634
	34B	Cap Screws (used w/mounting bracket)	2	16032-636
	35	Plug Assembly	2	32060-8
+	36	O-ring, 3/32 in. x 7/8 in. I.D [2.38mm x 22.23mm I.D.]	2	16015-18-90
	37	Spring	2	17079-2
	38	Relief Valve Assembly	2	◆
	39	Plug Assembly	1	16223-016
	39A	Tow Valve Assembly	1	70411-503
+	40	Retaining Ring	1	16078-6
	41	Separator Plug	1	70411-501
+	42	O-ring, 3/32 in. x 3/4 in. I.D. [2.38mm x 19.05mm I.D.]	1	16133 10
	43	Spreader	1	70411-502
+	44	O-ring, 1/16 in. x 3/8 in. I.D. [1,59mm x 9,53mm I.D.]	1	16003-7
	45	Coupler	1	70411-602
	46	Lock Ring	1	16008-0
	47	Inner Gerotor	1	◆
	48	Key	1	15222-20
	49	Outer Gerotor Ring	1	◆
+	51	O-ring, Molded (Used with Gerotor Adaptor Assy.)	1	70342-600
+	51A	O-ring, Molded (Used in front pump of tandem piston Assy.)	1	70111-703
	52	Adaptor Assembly	1	◆
	53	Check Valve Assembly	2	70111-505
+	54	Back-up Washer	2	16101-301
+	55	O-ring,1/16 in.x 7/16 in.I.D.[1,59mm x 11,11mm I.D.]	2	16015-1-90
	56	Steel Ball	2	16006-9
	57	Pin	2	70111-512
	58	Poppet Filter Relief	1	70111-507
	59	Spring	1	17000-48B

◆ Refer to matrix charts per description.
+ Included in seal repair kit 70442-932

(Continue)

(continued from previous page)

	Item No.	Description	Quantity	Model 70442
	60	Spring Retainer	1	70400-506
	61	Plug Assembly	1	16103-108
+	62	O-ring, 3/32 in. x 41/64 in. I.D.[2,38mm x 16,27mm I.D.]	1	16133-8
	63	Mounting Support Bracket	1	70411-605
+	64	O-ring, 1/16 in. x 3-1/4 in. I.D.[1,59mm x 82,55mm I.D.]	1	16007-14
	65	Cover Plate	1	70142-600
	66	Cap Screw	2	16032-610
	67	Cover Plate Kit	1	70142-915
	S	Seal Repair Kit	1	70442-932

Drive Shaft Matrix - Item No. 8

Description	Part Number
1 in. Keyed (Used in a single piston pump or piston pump w/Gear pump)	70442-275
1 in. 15Tooth Spline (Used in a single piston pump or piston pump w/Gear pump)	70442-202
1 in. 15Tooth Spline (Used in Front piston pump of tandem units)	70442-203
7/8 in. 41 Tooth Spline (Used in rear piston pump of tandem units)	70442-200

Camplate Matrix - Item No. 19

Description	Part Number
Front pump or single piston unit (Right Side)	70402-614
Rear pump of tandem piston unit(Left Side)	70402-613

Relief Valve Matrix - Item No. 38

Part Number	32060-QA	32060-UA	32060-WA	32060-ZA	32060-XA	32060-IA
Pressure Setting P.S.I. [bar]	2500[172]	3000[207]	3500[241]	4000[276]	4500[310]	5000[345]

Gerotor Matrix - Item No. 47 and 49

Description	Inner #47	Outer #49
Rear piston pump of tandem piston units	79004-605	79004-606
Single piston pump unit	79004-611	79004-612

Adapter Assembly Matrix - Item No. 52

Description of Installation	Part Number per Rotation		
	Dual	Left-hand	Right-hand
Front piston pump of tandem unit	70441-309	--	
Rear piston pump of tandem unit	--	70442-368	70441-374
Single piston pump unit	--	70442-362	70442-356

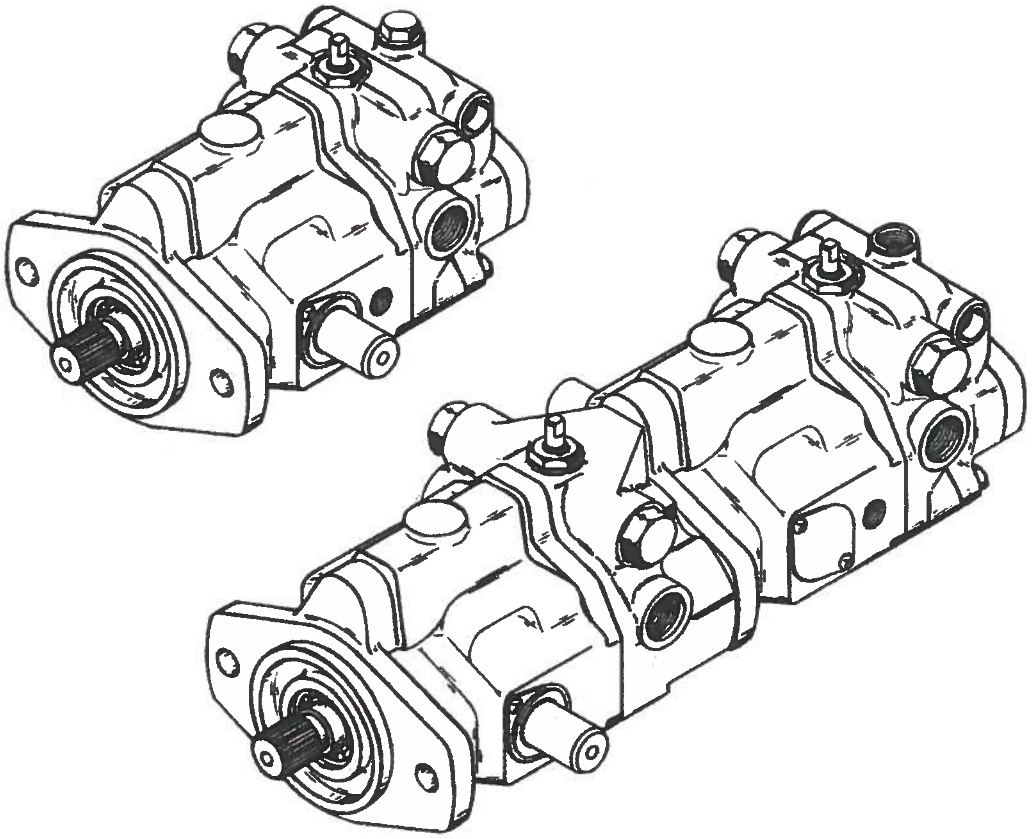
Backplate Matrix - Item No. 33

Description	Part Number
Front pump of Tandem unit	70441 410
Single Piston or Rear Pump of Tandem	70411-353

No. 6-626
Revised February, 1993

Eaton®
Medium Duty Piston Pump

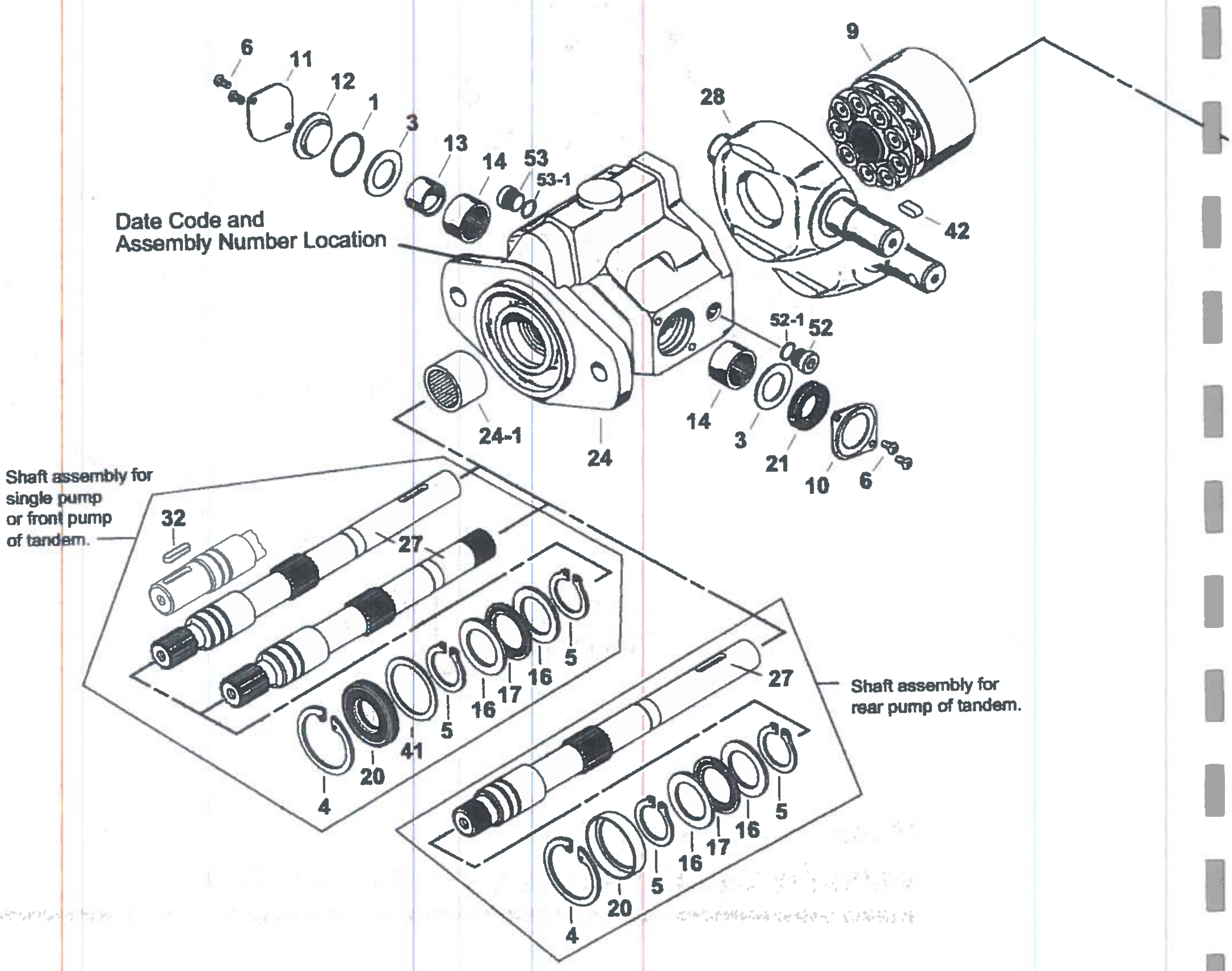
Parts Information



Model 70342 and 70344, 40.6 cm³/r [2.48 in³/r] Displacement
Manually Variable Displacement Piston Pump

Parts Drawing

Pump drawn below is typical of a righthand rotation pump.

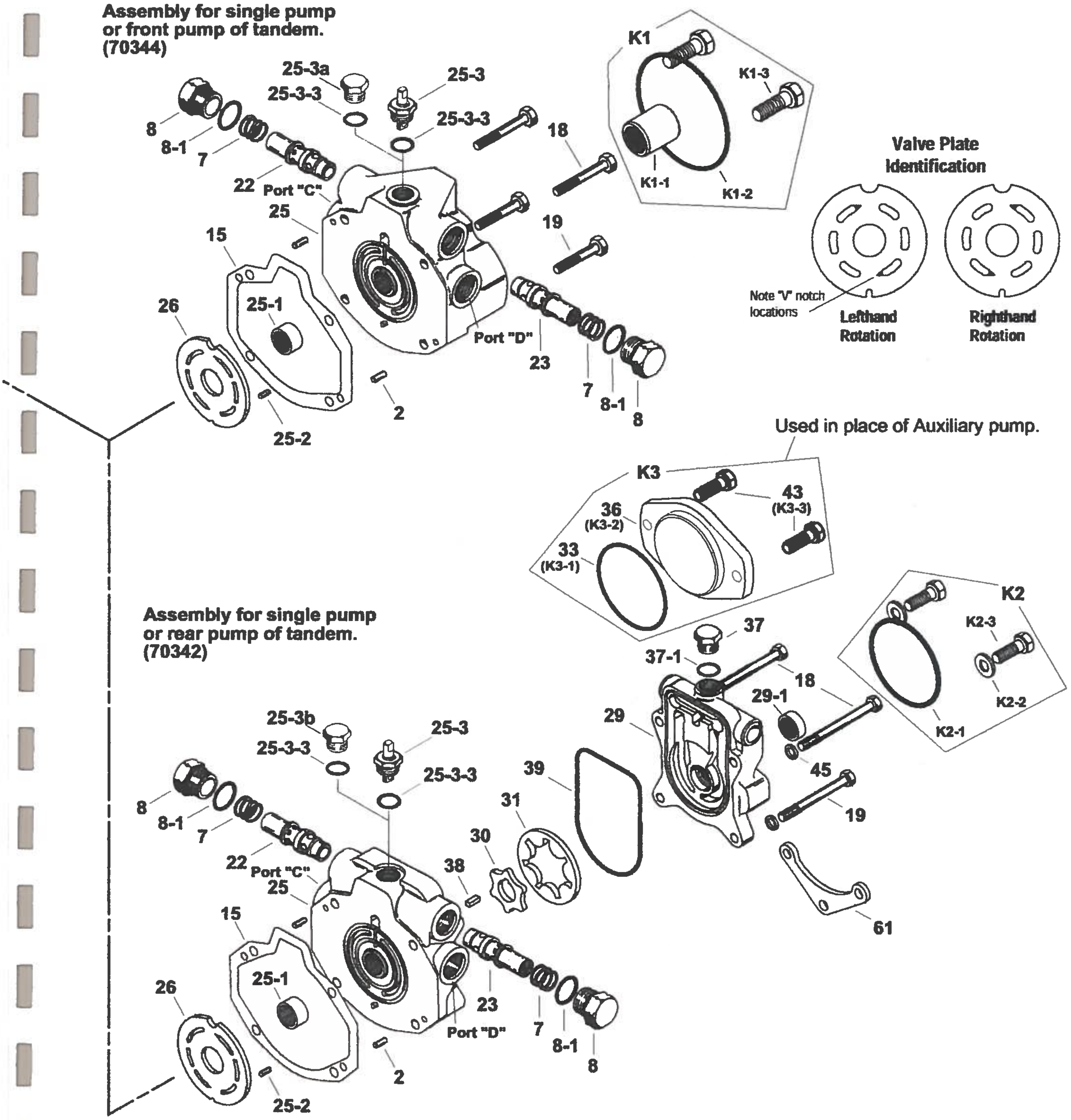


Date Code and Assembly Number Location

Shaft assembly for single pump or front pump of tandem.

Shaft assembly for rear pump of tandem.

Parts Drawing



Parts List

Item	Part No.	Qty.	Description
+ 1	16003-25	1	O-ring, 2.38 mm Dia. x 36.5 mm I.D. [.0937 in. Dia. x 1.4375 in. I.D.]
2	16028-404	2	Dowel Pin
3	16048-533	2	Washer
+ 4	16077-32	1	Retaining Ring
+ 5	16078-18	2	Retaining Ring
6	16268-306	4	Screw
7	17079-2	2	Spring
8	32060-8	2	Plug Assembly
+ 8-1	16015-18-90	2	O-ring, 2.38 mm Dia. x 22.23 mm I.D. [.0937 in. Dia. x .875 in. I.D.]
9	70300-603	1	Rotating Kit Assembly (parts list on page #6)
10	70400-624	1	Seal Cover
11	70400-625	1	Trunnion Cover
12	70400-693	1	O-ring Cover
13	70402-100	1	Inner Race
14	70412-151	2	Needle Bearing
+ 15	70412-626	1	Housing Gasket
16	74308-100	2	Thrust Race
17	74308-101	1	Needle Thrust Bearing
18	◆	2	Cap Screws (Locations on page #6)
	16032-622		3/8-16, 57.2 mm [2.25 in.] Long
	16040-640		3/8-16,101.6 mm [4.0 in.] Long
19	◆	2	Cap Screws (Locations on page #6)
	16032-616		3/8-16, 38.1 mm [1.5 in.] Long
	16032-620		3/8-16, 50.8 mm [2.0 in.] Long
	16032-634		3/8-16, 88.9 mm [3.5 in.] Long
+ 20	16253-18	1	Shaft Seal, Drive
20	16253-218	1	Viton Shaft Seal, Drive
20	70400-620	1	Spacer (Used in rear pump of tandem in place of drive shaft seal.)
+ 21	16253-16	1	Shaft Seal, Trunnion
21	16253-216	1	Viton Shaft Seal, Trunnion
22	◆	1	Relief Valve for Port "C" (Identification drawing on page #7)
23	◆	1	Relief Valve for Port "D" (Identification drawing on page #7)
24	◆	1	Housing Assembly (Identification drawing on page #7)
24-1	16238-11816	1	Bearing (press fit)
25	◆	1	Backplate Assembly (Identification drawing and parts list on page #8 & #9)
26		1	Valve Plate (Identification drawing on page #3)
	70344-51		Righthand (CW) Rotation
	70344-52		Lefthand (CCW) Rotation
27	◆	1	Drive Shaft (Identification drawing on page #12)
28	◆	1	Camplate
	70400-618		Key groove in trunnion
	70400-695		Cross hole in trunnion
29	◆	1	Charge Pump Adaptor (Identification drawing and parts list on page #10 & #11)
30		1	Inner Gerotor
	79004-611		6.9 cm^3/r [.42 in^3/r] displacement, 6.35 mm [.25 in] width
	79004-605		13.8 cm^3/r [.84 in^3/r] displacement, 12.7 mm [.5 in] width
31		1	Outer Gerotor
	79004-612		6.9 cm^3/r [.42 in^3/r] displacement, 6.35 mm [.25 in] width
	79004-606		13.8 cm^3/r [.84 in^3/r] displacement, 12.7 mm [.5 in] width
32		1	Key, Drive Shaft
	16246-516		Used with 25.4 mm[1.00 in] dia. drive shaft.
	24500-619		Used with 22.2 mm [.875 in] dia. drive shaft.
33	16007-14	1	O-ring (In K2 & K3 kit)
35	70411-605	1	Mounting Bracket
36	70142-600	1	Cover Plate (In K3 kit)

Parts List

	37	16103-108	1	Plug Assembly
+	37-1	16133-8	1	O-ring, 2.21 mm Dia. x 16.36 mm ID. [.087 in. Dia. x .644 in. ID.]
	38	15222-20	1	Key, Gerotor Pump Adapter
+n	39	70342-600	1	Molded O-ring
	40	16048-113	2	Washer
	41	16048-319	1	Washer
	42	16246-523	1	Key, Camplate Trunnion
	43	16032-610	2	Cap Screws, Cover Plate (In K3 kit)
	52	16103-306	1	Plug Assembly
	52-1	16133-6	1	O-ring, 1.98 mm Dia. x 11.89 mm ID. [.078 in. Dia. x .468 in. ID.]
	53	16103-306	1	Plug Assembly
	53-1	16133-6	1	O-ring, 1.98 mm Dia. x 11.89 mm ID. [.078 in. Dia. x .468 in. ID.]

Mounting Kits

K1	70342-905	1	Tandem Piston Pump Mounting Kit
K1-1	70411-622	1	41T Coupler, 33.02 mm [1.3 in.] long
K1-2	16007-17	1	O-ring, 1.59 mm Dia. x 101.6 mm ID. [.0625 in. Dia. x 4 in. ID.]
K1-3	16032-812	2	Cap Screws
K2	70442-929	1	Gear Pump Mounting Kit
K2-1	16007-14	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K2-2	16048-113	1	Washer
K2-3	16032-612	2	Cap Screws
K3	70142-915	1	Cover Plate Kit
K3-1	16007-14	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K3-2	70142-600	1	Cover Plate
K3-3	16032-610	2	Cap Screws

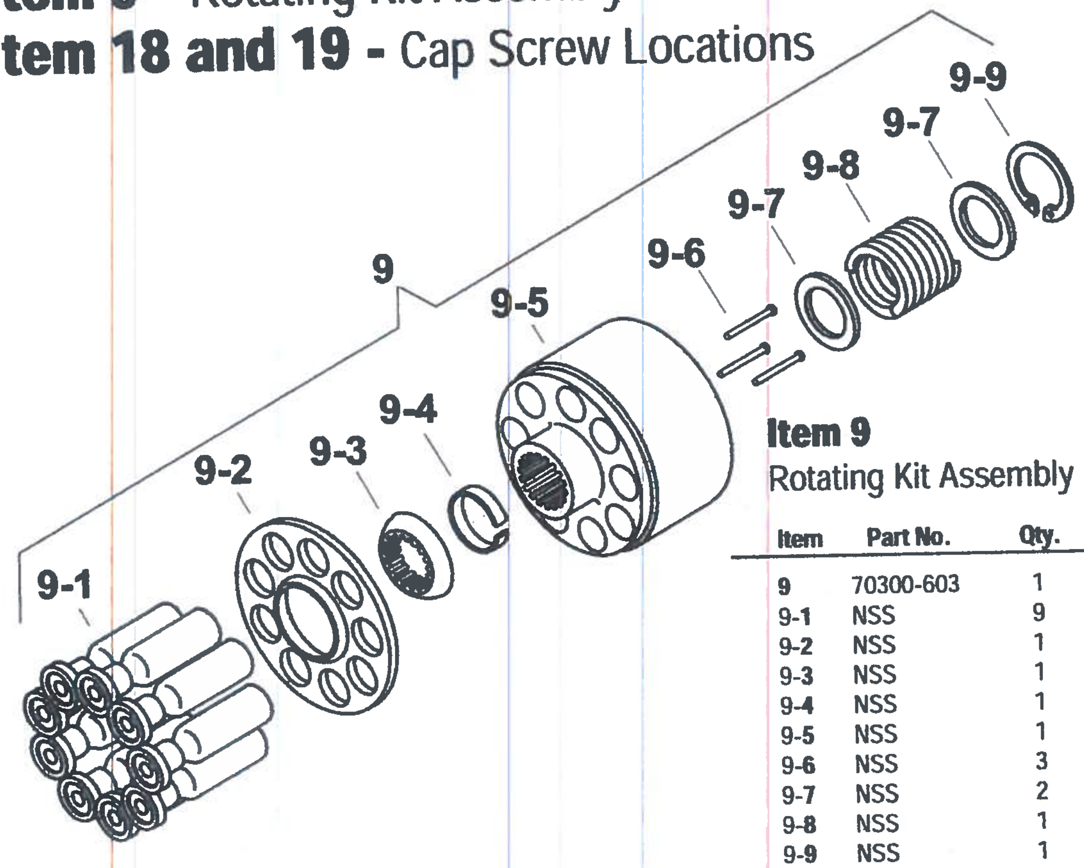
Seal Repair Kits

•	70342-900	1	Seal Repair Kit for 70342 piston pump.
•	70342-901	1	Seal Repair Kit for 70342 piston pump (Shaft seal not included).
•	70342-902	1	Seal Repair Kit for 70342 piston pump (Includes dump valve seals).
•	70344-900	1	Seal Repair Kit for 70344 piston pump (Shaft seal not included).
•	70344-902	1	Seal Repair Kit for 70344 piston pump.

Legend

◆	Refer to specific item parts list.
+	Common parts to seal repair kits listed.
+o	Parts included in the 70342-902 and 70344-902 along with common parts.
+n	Parts included in the 70342-900, 70342-901, and 70342-902 along with common parts.

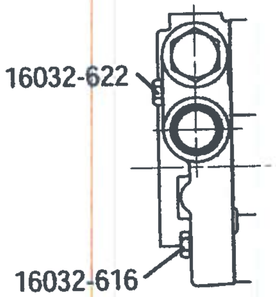
Item 9 - Rotating Kit Assembly
Item 18 and 19 - Cap Screw Locations



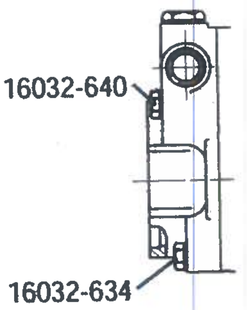
Item 9
Rotating Kit Assembly

Item	Part No.	Qty.	Description
9	70300-603	1	Rotating Kit Assy.
9-1	NSS	9	Piston Assembly
9-2	NSS	1	Spider
9-3	NSS	1	Spider Pivot
9-4	NSS	1	Retainer
9-5	NSS	1	Piston Block
9-6	NSS	3	Pins
9-7	NSS	2	Washer
9-8	NSS	1	Spring
9-9	NSS	1	Retaining Ring
	NSS - Not Sold Separately		

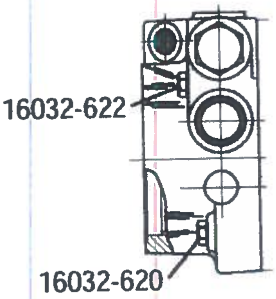
Item 18 and 19
Cap Screw Locations



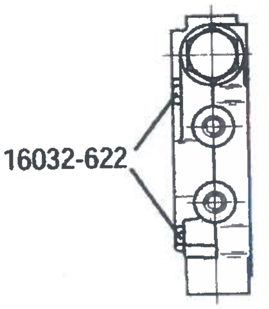
**Rear "A" Flange,
without Gerotor,
Opposite Side Porting**



**Rear "A" Flange,
with Gerotor,
Opposite Side Porting**



**Rear "B" Flange,
without Gerotor,
Opposite Side Porting**

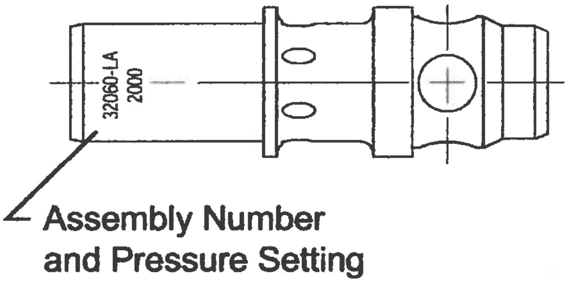


**Rear "A" Flange,
without Gerotor,
Same Side Porting**

Item 22 or 23 - Relief Valve
Item 24 - Housing Identification

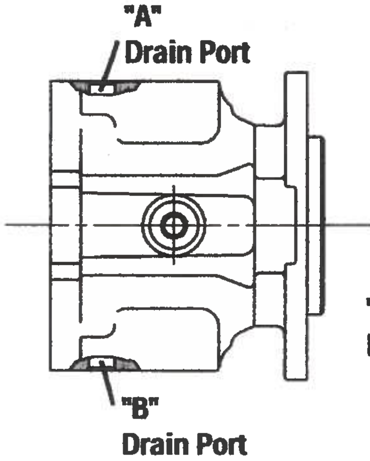
Item 22 or 23
Internal Relief Valve Settings Available

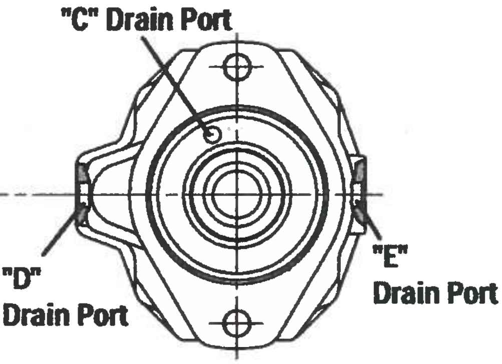
Part Number	bar [lbf/in²]
32060-LA	138 [2000]
32060-QA	172 [2500]
32060-UA	207 [3000]
32060-WA	241 [3500]
32060-ZA	276 [4000]
32060-XA	310 [4500]
32060-IA	345 [5000]
70111-518	Seat, Valve



Item 24
Housing Identification

Item	Part No.	Port Machined
24	70300-315	A, C
	70300-316	None
	70300-318	E
	70300-320	C
	70300-322	A
	70300-324	B, C
	70300-326	D
	70300-328	B
	70300-377	C, D
	70300-381	A, B
	70300-383	A, B, C





Drain Port Sizes:
Drain Port A, B, D, and E are 9/16-18 SAE Str. Thd.
Thru Drain Port C is 9.55[.376] dia.

Item 25 -

Backplate Assembly Identification

Item 25 - Parts List (Refer to Identification chart and drawings)

	Item	Part No.	Qty.	Description
	25	See Chart Below		Backplate Assembly
	25-1	52200-23	1	Bearing
	25-2	16026-610	1	Dowel Pin
	25-3	70300-610	1	Dump Valve Assembly
+o	25-3-1	16078-6	1	Retaining Ring
	25-3-2	70300-609	1	Separator Plug
+	25-3-3	16133-8	1	O-ring, 2.38 mm Dia. x 16.27 mm I.D. [.0937 in. Dia. x .6406 in. I.D.]
	25-3-4	70411-502	1	Speader
+o	25-3-5	16003-7	1	O-ring, 1.59 mm Dia. x 9.53 mm I.D. [.0625 in. Dia. x .375 in. I.D.
	25-3a	16103-108	1	Plug Assembly, Hex
+	25-3-3	16133-8	1	O-ring, 2.38 mm Dia. x 16.27 mm I.D. [.0937 in. Dia. x .6406 in. I.D.]
	25-3b	16103-308	1	Plug Assembly, Internal Hex Socket
+	25-3-3	16133-8	1	O-ring, 2.38 mm Dia. x 16.27 mm I.D. [.0937 in. Dia. x .6406 in. I.D.]
	25-4	70400-501	1or2	Cartridge, Bleed-off
	25-5	16133-5	1or2	O-ring, 1.83 mm Dia. x 10.5 mm I.D. [.072 in. Dia. .414 in. I.D.]
	25-6	17023-12	1or2	Spring
	25-7	70400-508	1or2	Poppet, Bleed-off Valve

Legend		
	+	Common parts to seal repair kits listed.
	+o	Parts included in the 70342-902 and 70344-902 along with common parts.

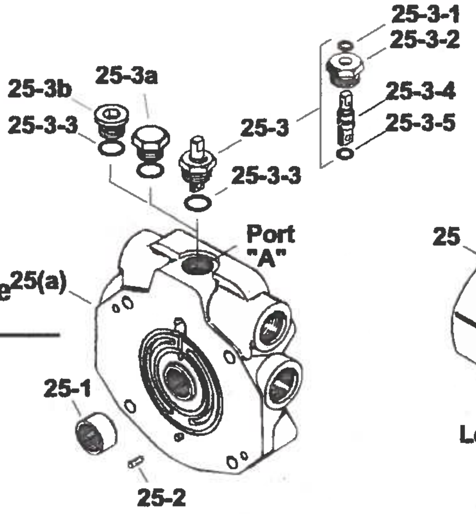
Item 25

Backplate Assembly Identification (Refer to drawings on page #9)

Description	Assembly Part Number	Aux. Port Machined	"A" Aux. Port Plug	"B" Aux. Port Plug	"A" Aux. Port Dump Valve	"B" Aux. Port Dump Valve	Bleed-off Valve Left	Bleed-off Valve Right
25(a) - Accepts Gerotor Charge Pump	70300-413	A	Item 25-3a					
	70300-426	A			Item 25-3			
25(b) - Rear "A" Mount, Opposite Side Porting	70300-409	A						
	70300-415	A, B				Item 25-3		
25(c) - Rear "A" Mount, Same Side Porting	70300-403	A, B	Item 25-3a					
	70300-421	A, B		Item 25-3b				
	70300-437	A, B	Item 25-3b					
25(d) - Rear "B" Mount, Opposite Side Porting	70300-407	A						
	70300-411	A, B			Item 25-3			
	70300-439	A, B	Item 25-3a					
	70390-410	A					Yes	Yes
25(e) - Rear "B" Mount, Same Side Porting	70300-401	A, B	Item 25-3a					
	70300-418	A, B		Item 25-3a				
	70390-403	A, B	Item 25-3b				Yes	

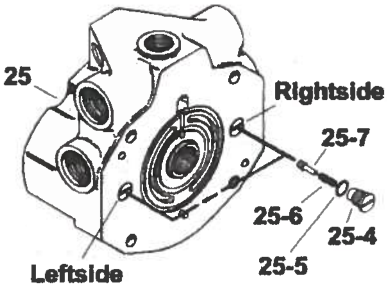
Item 25 -

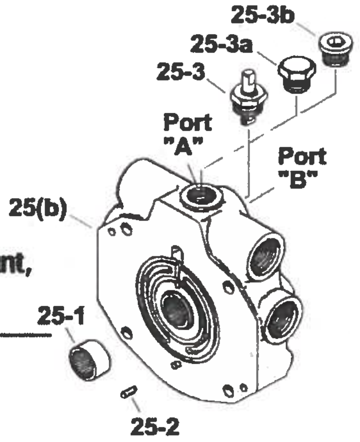
Backplate Assembly Identification



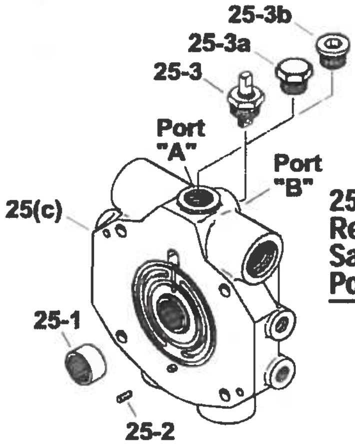
25(a) Accepts Gerotor Charge Pump

Bleed-off Valve Location

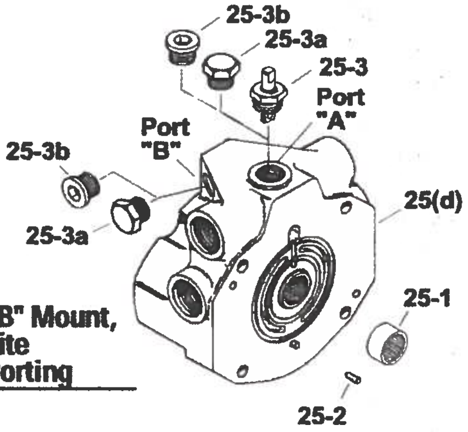




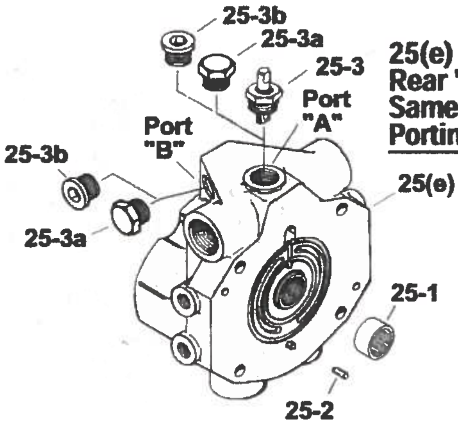
25(b) Rear "A" Mount, Opposite Side Porting



25(c) Rear "A" Mount, Same Side Porting



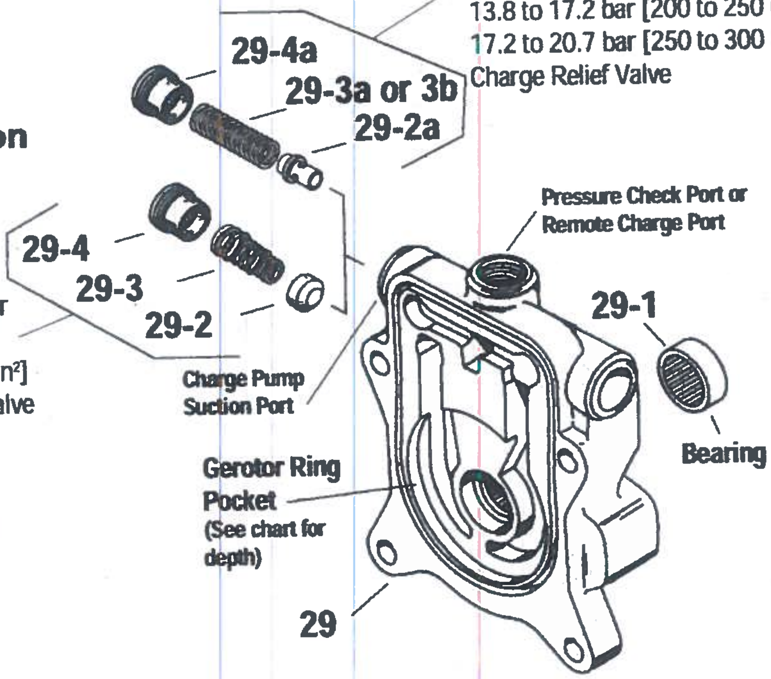
25(d) Rear "B" Mount, Opposite Side Porting



25(e) Rear "B" Mount, Same Side Porting

Item 29 -
Charge Pump Adapter Assembly Identification

Righthand Rotation


29-4a
29-3a or 3b
29-2a
29-4
29-3
29-2
Pressure Check Port or Remote Charge Port
29-1
Bearing
Charge Pump Suction Port
Gerotor Ring Pocket (See chart for depth)
29

Configuration for
13.8 to 17.2 bar [200 to 250 lbf/in²] or
17.2 to 20.7 bar [250 to 300 lbf/in²]
Charge Relief Valve

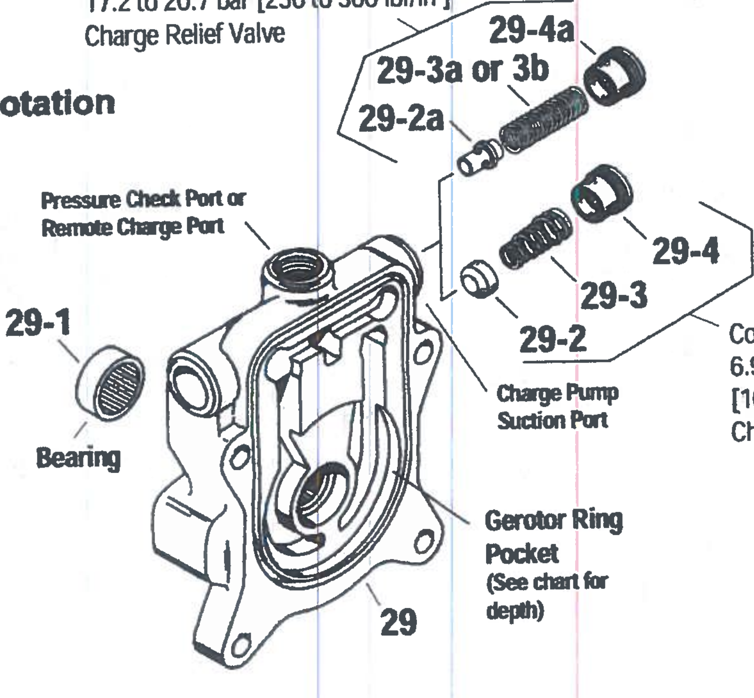
Configuration for
6.9 to 1.3 bar
[100 to 150 lbf/in²]
Charge Relief Valve

Gerotor Pocket Depth

Displacement cm³/r [in³/r]	Depth of Pocket mm [in.]
6.9 [.42]	6.35 [.25]
13.8 [.84]	12.7 [.50]

Lefthand Rotation

Configuration for
13.8 to 17.2 bar [200 to 250 lbf/in²] or
17.2 to 20.7 bar [250 to 300 lbf/in²]
Charge Relief Valve


29-4a
29-3a or 3b
29-2a
Pressure Check Port or Remote Charge Port
29-1
Bearing
29-4
29-3
29-2
Charge Pump Suction Port
Gerotor Ring Pocket (See chart for depth)
29

Configuration for
6.9 to 1.3 bar
[100 to 150 lbf/in²]
Charge Relief Valve

Item 29 -
Charge Pump Adapter Assembly

No Charge Relief

Item	Part No.	Qty.	Description	Rotation	Displacement
29	70440-369	1	Assembly, Charge Pump Adapter	Righthand	13.8 cm^3/r [.84 in^3/r]
29-1	16239-1148	1	Bearing (press fit)		

6.9 to 1.3 bar [100 to 150 lbf/in^2] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
29	70442-356	1	Assembly, Charge Pump Adapter	Righthand	6.88 cm^3/r [.42 in^3/r]
	70442-368	1	Assembly, Charge Pump Adapter	Lefthand	13.8 cm^3/r [.84 in^3/r]
	70442-374	1	Assembly, Charge Pump Adapter	Righthand	13.8 cm^3/r [.84 in^3/r]
	70442-389	1	Assembly, Charge Pump Adapter	Lefthand	6.88 cm^3/r [.42 in^3/r]
29-1	16239-1148	1	Bearing (press fit)		
29-2	70111-507	1	Poppet, Cup		
29-3	17000-48B	1	Spring, Tapered		
29-4	70400-505	1	Spring Retainer		

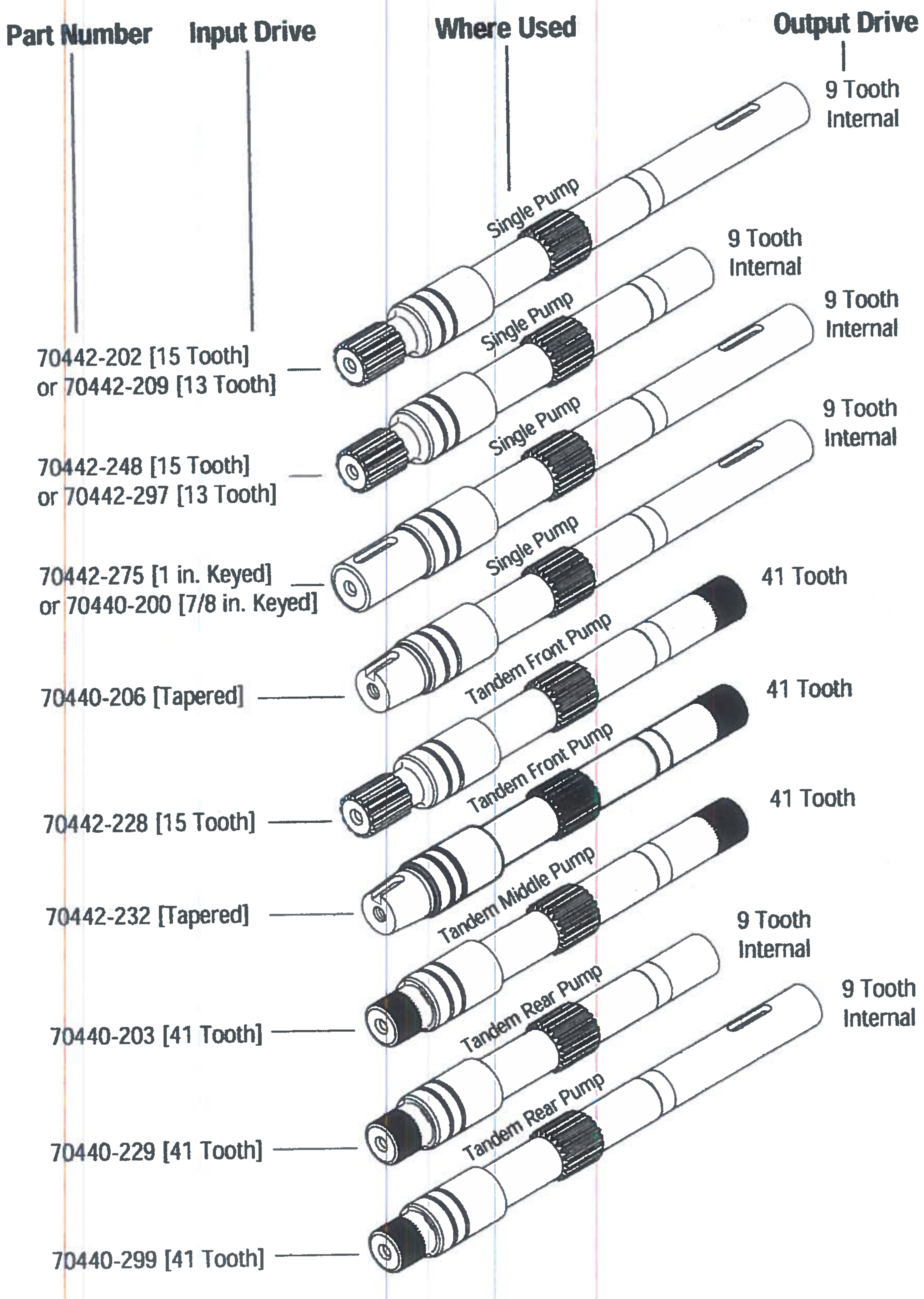
13.8 to 17.2 bar [200 to 250 lbf/in^2] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
29	70440-363	1	Assembly, Charge Pump Adapter	Lefthand	6.88 cm^3/r [.42 in^3/r]
	70440-371	1	Assembly, Charge Pump Adapter	Righthand	6.88 cm^3/r [.42 in^3/r]
	70440-373	1	Assembly, Charge Pump Adapter	Righthand	13.8 cm^3/r [.84 in^3/r]
29-1	16239-1148	1	Bearing (press fit)		
29-2a	70400-685	1	Poppet, Pin		
29-3a	17056-40	1	Spring, Color "Light Green"		
29-4a	70400-512	1	Spring Retainer		

17.2 to 20.7 bar [250 to 300 lbf/in^2] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
29	70440-335	1	Assembly, Charge Pump Adapter	Righthand	6.88 cm^3/r [.42 in^3/r]
	70440-374	1	Assembly, Charge Pump Adapter	Righthand	13.8 cm^3/r [.84 in^3/r]
29-1	16239-1148	1	Bearing (press fit)		
29-2a	70400-685	1	Poppet, Pin		
29-3b	17056-41	1	Spring, Color "Pink"		
29-4a	70400-512	1	Spring Retainer		

Item 27 - Drive Shaft Identification



Product Number - Parts List for Single Pumps

This list of product numbers is to aid in Item identification. If your product number is not listed contact your Eaton representitive.

Single Pump with Lefthand Rotation (CCW)

Description	Cap Screw	Cap Screw	Shaft Seal	Relief Valve "C"	Relief Valve "D"	Housing Assembly	Backplate Assembly	Drive Shaft	Camplate	Adapter Assembly	Inner Gerotor	Outer Gerotor	
Item	#18	#19	#20	#22	#23	#24	#25	#27	#28	#29	#30	#31	Seal Repair Kit
Product Number													
70342-LAA	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70442-275	70400-695	70442-389	79004-611	79004-612	70342-900
70342-LAB	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70442-202	70400-695	70442-389	79004-611	79004-612	70342-900
70342-LAF	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70442-209	70400-695	70442-389	79004-611	79004-612	70342-900
70342-LAJ	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70442-209	70400-618	70442-389	79004-611	79004-612	70342-900
70342-LAK	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70440-200	70400-618	70442-389	79004-611	79004-612	70342-900
70342-LAL	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-328	70300-413	70442-202	70400-618	70442-389	79004-611	79004-612	70342-900
70342-LAM	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-328	70300-413	70442-275	70400-618	70442-389	79004-611	79004-612	70342-900
70342-LAN	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-328	70300-413	70442-209	70400-618	70442-389	79004-611	79004-612	70342-900
70342-LAW	16032-640	16032-634	16253-18	70111-518	70111-518	70300-322	70300-413	70442-209	70400-618	70442-389	79004-611	79004-612	70342-900
70342-LBJ	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70442-209	70400-695	70442-389	79004-611	79004-612	70342-900
70342-LBL	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-328	70300-413	70442-209	70400-695	70442-389	79004-611	79004-612	70342-900
70342-LBQ	16032-640	16032-634	16253-18	32060-LA	32060-LA	70300-322	70300-413	70442-209	70400-618	70442-389	79004-611	79004-612	70342-900
70342-LBR	16032-640	16032-634	16253-18	32060-WA	32060-WA	70300-322	70300-413	70442-202	70400-695	70442-389	79004-611	79004-612	70342-900

Single Pump with Righthand Rotation (CW)

Description	Cap Screw	Cap Screw	Shaft Seal	Relief Valve "C"	Relief Valve "D"	Housing Assembly	Backplate Assembly	Drive Shaft	Camplate	Adapter Assembly	Inner Gerotor	Outer Gerotor	
Item	#18	#19	#20	#22	#23	#24	#25	#27	#28	#29	#30	#31	Seal Repair Kit
Product Number													
70342-RAA	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70442-275	70400-695	70442-356	79004-611	79004-612	70342-900
70342-RAJ	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70442-202	70400-695	70442-356	79004-611	79004-612	70342-900
70342-RAM	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70442-209	70400-695	70442-356	79004-611	79004-612	70342-900
70342-RAQ	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70442-209	70400-618	70442-356	79004-611	79004-612	70342-900
70342-RAR	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70440-200	70400-618	70442-356	79004-611	79004-612	70342-900
70342-RAS	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-328	70300-413	70442-202	70400-618	70442-356	79004-611	79004-612	70342-900
70342-RAT	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-328	70300-413	70442-275	70400-618	70442-356	79004-611	79004-612	70342-900
70342-RAU	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-328	70300-413	70442-209	70400-618	70442-356	79004-611	79004-612	70342-900
70342-RAX	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-328	70300-413	70442-209	70400-618	70442-356	79004-611	79004-612	70342-900
70342-RAY	16032-640	16032-634	16253-18	32060-WA	32060-WA	70300-322	70300-413	70442-202	70400-618	70442-374	79004-605	79004-606	70342-900
70342-RAZ	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70442-209	70400-695	70442-356	79004-611	79004-612	70342-900
70342-RBN	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70442-209	70400-695	70440-371	79004-611	79004-612	70342-900
70342-RBP	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-328	70300-413	70442-200	70400-618	70442-374	79004-605	79004-606	70342-900
70342-RBV	16032-640	16032-634	16253-18	32060-ZA	32060-ZA	70300-322	70300-413	70442-202	70400-695	70442-356	79004-611	79004-612	70342-900
70342-RBW	16032-640	16032-634	16253-18	32060-WA	32060-LA	70300-322	70300-413	70442-202	70400-695	70442-356	79004-611	79004-612	70342-900
70342-RCA	16032-640	16032-634	16253-18	32060-ZA	32060-ZA	70300-322	70300-426	70442-202	70400-618	70440-335	79004-611	79004-612	70342-900
70342-RCB	16032-640	16032-634	16253-18	32060-UA	32060-UA	70300-322	70300-413	70442-209	70400-695	70442-374	79004-605	79004-606	70342-900
70342-RCC	16032-640	16032-634	16253-18	32060-IA	32060-IA	70300-322	70300-413	70442-202	70400-695	70440-371	79004-611	79004-612	70342-900
70342-RCD	16032-640	16032-634	16253-18	32060-UA	32060-UA	70300-322	70300-413	70442-209	70400-695	70442-356	79004-611	79004-612	70342-900
70342-RCH	16032-640	16032-634	16253-18	32060-UA	32060-UA	70300-322	70300-426	70442-209	70400-695	70442-356	79004-611	79004-612	70342-900
70342-RCJ	16032-640	16032-634	16253-18	32060-WA	32060-WA	70300-322	70300-413	70442-209	70400-618	70442-356	79004-611	79004-612	70342-900
70342-RCK	16032-640	16032-634	16253-18	32060-SA	32060-SA	70300-322	70300-426	70442-275	70400-695	70442-356	79004-611	79004-612	70342-900
70344-RBR	16032-622	16032-616	16253-18	32060-IA	32060-IA	70300-322	70300-415	70442-297	70400-618	---	---	---	70344-902
70344-RCQ	16032-622	16032-616	16253-18	32060-IA	32060-IA	70300-322	70300-409	70442-248	70400-695	---	---	---	70344-900

Product Number - Parts List for Tandem Front Pump

This list of product numbers is to aid in Item identification. If your product number is not listed contact your Eaton representitive.

Description	Cap Screw	Cap Screw	Shaft Seal	Relief Valve "C"	Relief Valve "D"	Housing Assembly	Backplate Assembly	Drive Shaft	Camplate	
Item	#18	#19	#20	#22	#23	#24	#25	#27	#28	Seal Repair Kit
Tandem Front Pump with Lefthand Rotation (CCW)										
Product Number										
70344-LAM	16032-622	16032-620	16253-18	70111-518	70111-518	70300-316	70300-407	70442-228	70400-618	70344-900
70344-LAP	16032-622	16032-620	16253-18	32060-UA	32060-UA	70300-316	70300-407	70442-228	70400-618	70344-900
70344-LAR	16032-622	16032-620	16253-18	32060-WA	32060-WA	70300-316	70300-407	70442-228	70400-695	70344-900
70344-LAS	16032-622	16032-620	16253-18	32060-ZA	32060-ZA	70300-316	70300-407	70442-228	70400-695	70344-900
70344-LAT	16032-622	16032-620	16253-18	32060-UA	32060-UA	70300-316	70300-407	70440-228	70400-695	70344-900
70344-LAU	16032-622	16032-620	16253-18	32060-XA	32060-XA	70300-316	70300-407	70442-228	70400-695	70344-900
70344-LAV	16032-622	16032-620	16253-18	32060-ZA	32060-ZA	70300-316	70300-407	70442-228	70400-695	70344-900
70344-LBB	16032-622	16032-620	16253-18	32060-IA	32060-IA	70300-316	70300-411	70442-228	70400-618	70344-902
70344-LBC	16032-622	16032-620	16253-18	32060-IA	32060-IA	70300-316	70300-407	70442-228	70400-695	70344-900
70344-LBD	16032-622	16032-620	16253-18	32060-IA	32060-IA	70300-316	70300-407	70442-228	70400-695	70344-900
Tandem Front Pump with Righthand Rotation (CW)										
Product Number										
70344-RAE	16032-622	16032-622	16253-18	70111-518	32060-UA	70300-318	70300-401	70442-232	70400-618	70344-900
70344-RAG	16032-622	16032-622	16253-18	70111-518	32060-WA	70300-318	70300-401	70442-232	70400-618	70344-900
70344-RAL	16032-622	16032-620	16253-18	32060-UA	32060-UA	70300-316	70300-407	70442-228	70400-618	70344-900
70344-RAQ	16032-622	16032-622	16253-18	32060-WA	32060-WA	70300-326	70300-403	70442-228	70400-618	70344-901
70344-RBA	16032-622	16032-620	16253-18	32060-IA	32060-IA	70300-316	70300-407	70440-228	70400-618	70344-900
70344-RBG	16032-622	16032-620	16253-18	32060-IA	32060-IA	70300-316	70300-407	70442-232	70400-618	70344-900
70344-RBL	16032-622	16032-620	16253-18	32060-XA	70111-518	70300-316	70300-411	70442-228	70400-618	70344-902
70344-RBM	16032-622	16032-620	16253-18	32060-XA	32060-XA	70300-316	70300-407	70442-228	70400-618	70344-900
70344-RBN	16032-622	16032-620	16253-18	32060-UA	32060-UA	70300-316	70300-411	70442-228	70400-618	70344-902
70344-RBP	16032-622	16032-620	16253-18	32060-ZA	32060-ZA	70300-316	70300-411	70442-228	70400-618	70344-902
70344-RBQ	16032-622	16032-620	16253-18	32060-XA	32060-XA	70300-316	70300-411	70442-228	70400-695	70344-902
70344-RBZ	16032-622	16032-620	16253-18	32060-WA	32060-WA	70300-316	70300-407	70442-228	70400-695	70344-900
70344-RCA	16032-622	16032-620	16253-18	32060-ZA	32060-ZA	70300-316	70300-407	70442-228	70400-695	70344-900
70344-RCB	16032-622	16032-620	16253-18	32060-UA	32060-UA	70300-316	70300-407	70442-228	70400-695	70344-900
70344-RCC	16032-622	16032-620	16253-18	32060-XA	32060-XA	70300-316	70300-407	70442-228	70400-695	70344-900
70344-RCD	16032-622	16032-620	16253-18	32060-ZA	32060-ZA	70300-316	70300-407	70442-228	70400-695	70344-900
70344-RCE	16032-622	16032-622	16253-18	32060-WA	32060-WA	70300-326	70300-403	70442-228	70400-618	70344-901
70344-RCG	16032-622	16032-620	16253-18	32060-IA	32060-IA	70300-316	70300-411	70442-228	70400-695	70344-902
70344-RCK	16032-622	16032-620	16253-18	32060-IA	32060-IA	70300-316	70300-410	70442-228	70400-618	70344-901
70344-RCM	16032-622	16032-620	16253-18	32060-IA	32060-IA	70300-316	70300-411	70442-228	70400-618	70344-902
70344-RCN	16032-622	16032-620	16253-18	32060-IA	32060-IA	70300-316	70300-407	70442-228	70400-695	70344-900
70344-RCP	16032-622	16032-620	16253-18	32060-IA	32060-IA	70300-316	70300-407	70442-228	70400-695	70344-900
70344-RCS	16032-622	16032-620	16253-18	32060-ZA	32060-ZA	70300-316	70300-411	70442-228	70400-695	70344-902

Product Number - Parts List for Tandem Rear Pump

This list of product numbers is to aid in Item identification. If your product number is not listed contact your Eaton representitive.

Description	Cap Screw	Cap Screw	Spacer	Relief Valve "C"	Relief Valve "D"	Housing Assembly	Backplate Assembly	Drive Shaft	Camplate	Adapter Assembly	Inner Gerotor	Outer Gerotor	
Item	#18	#19	#20	#22	#23	#24	#25	#27	#28	#29	#30	#31	Seal Repair Kit
Tandem Rear Pump with Lefthand Rotation (CCW)													
Product Number													
70342-LAH	16032-640	16032-634	70400-620	32060-IA	32060-IA	70300-315	70300-413	70442-299	70400-695	70442-368	79004-605	79004-606	70342-901
70342-LAQ	16032-640	16032-634	70400-620	32060-IA	32060-IA	70300-315	70300-413	70442-299	70400-618	70442-368	79004-605	79004-606	70342-901
70342-LBG	16032-640	16032-634	70400-620	32060-WA	32060-WA	70300-315	70300-413	70442-299	70400-695	70442-368	79004-605	79004-606	70342-901
Tandem Rear Pump with Righthand Rotation (CW)													
Product Number													
70342-RAN	16032-640	16032-634	70400-620	32060-IA	32060-IA	70300-315	70300-413	70442-299	70400-695	70442-374	79004-605	79004-606	70342-901
70342-RAW	16032-640	16032-634	70400-620	32060-IA	32060-IA	70300-315	70300-413	70442-299	70400-695	70442-374	79004-605	79004-606	70342-901
70342-RBD	16032-640	16032-634	70400-620	32060-ZA	32060-ZA	70300-315	70300-426	70442-299	70400-618	70442-374	79004-605	79004-606	70342-902
70342-RBF	16032-640	16032-634	70400-620	70111-518	32060-XA	70300-315	70300-426	70442-299	70400-618	70442-374	79004-605	79004-606	70342-902
70342-RBJ	16032-640	16032-634	70400-620	32060-UA	32060-UA	70300-315	70300-426	70440-299	70400-618	70442-374	79004-605	79004-606	70342-902
70342-RBL	16032-640	16032-634	70400-620	32060-XA	32060-XA	70300-315	70300-426	70442-299	70400-695	70442-374	79004-605	79004-606	70342-902
70342-RBQ	16032-640	16032-634	70400-620	32060-IA	32060-IA	70300-315	70300-426	70442-299	70400-695	70442-374	79004-605	79004-606	70342-902
70342-RBS	16032-640	16032-634	70400-620	32060-UA	32060-UA	70300-315	70300-413	70442-299	70400-695	70442-374	79004-605	79004-606	70342-901
70342-RBT	16032-640	16032-634	70400-620	32060-XA	32060-XA	70300-315	70300-413	70442-299	70400-695	70442-374	79004-605	79004-606	70342-901
70342-RBU	16032-640	16032-634	70400-620	32060-ZA	32060-ZA	70300-315	70300-413	70442-299	70400-695	70442-374	79004-605	79004-606	70342-901
70342-RCE	16032-640	16032-634	70400-620	32060-ZA	32060-ZA	70300-315	70300-426	70442-299	70400-695	70442-374	79004-605	79004-606	70342-902
70344-RAF	16032-622	16032-622	70400-620	70111-518	32060-UA	70300-320	70300-403	70442-229	70400-618	---	---	---	70344-900
70344-RAH	16032-622	16032-622	70400-620	70111-518	32060-WA	70300-320	70300-403	70442-229	70400-618	---	---	---	70344-900
70344-RAM	16032-622	16032-616	70400-620	32060-UA	32060-UA	70300-324	70300-409	70442-229	70400-618	---	---	---	70344-900
70344-RAR	16032-622	16032-622	70400-620	70111-518	32060-WA	70300-320	70300-403	70442-229	70400-618	---	---	---	70344-900
70344-RBB	16032-622	16032-616	70400-620	32060-IA	32060-IA	70300-324	70300-409	70442-229	70400-618	---	---	---	70344-900
70344-RBU	16032-622	16032-616	70400-620	32060-XA	32060-XA	70300-324	70300-409	70442-229	70400-618	---	---	---	70344-900
70344-RCF	16032-622	16032-622	70400-620	70111-518	32060-WA	70300-320	70300-437	70442-229	70400-618	---	---	---	70344-900

Each order must include the following information.

1. Product and/or Part Number
2. Serial Number Code
3. Part Name
4. Quantity

Identification Numbers - Manually Variable Displacement Piston Pump

Stamped on each units mounting flange.

A - Product Number Description
  70342 = Single Piston Pump with Gerotor
  70344 = Single Piston Pump without Gerotor
  78341 = Tandem Piston Pumps with Gerotor
  78343 = Tandem Piston Pumps without Gerotor
B - Sequential Numbering

Single Pump - Product Number:

70342 - RAA

A = 70342, B = RAA

Tandem Pumps - Product Number:

78341 - RAB

A = 78341, B = RAB

Serial Number Code:

B 91 01 31 JB

B - Revision level of parts list.
91 - Last two digits of year built. (91 for 1991 etc.)
01 - Month (two digits)
31 - Day of Month (two digits)
JB - Testers Initials

DNV
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ISO-9001 CERTIFICATED FIRM

Quality System Certified
Products in this catalog are manufactured in an ISO-9001-certified site.

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EATON

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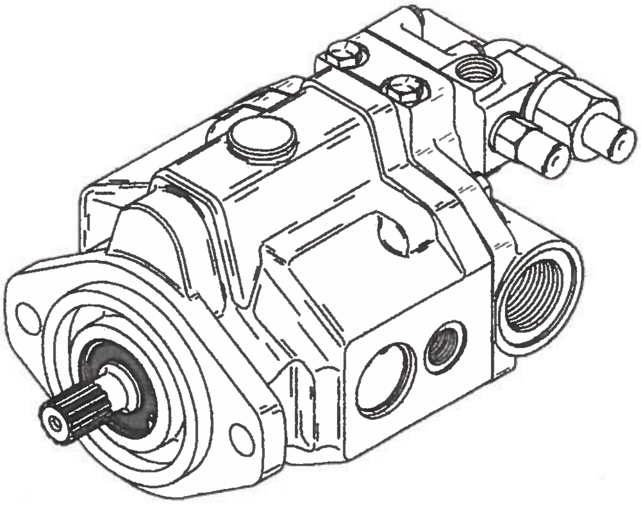
Eaton®
Medium Duty Piston Pump

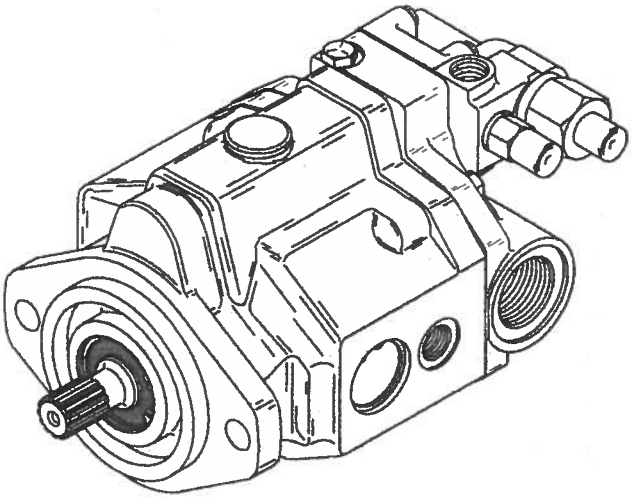
No. 6-631
January 1998

Parts and Repair Information



Model 70422 or 70452
0 - 38 cm³/r [0 - 2.32 in³/r]
Displacement

Model 70423 or 70453
0 - 45 cm³/r [0 - 2.77 in³/r]
Displacement



Pressure or Pressure-Flow Compensated Piston Pumps

Introduction

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Introduction

This manual provides service information for the Eaton Models 70422 or 70423 Pressure or Pressure - Flow Compensated Piston Pumps. Step by step instructions for the complete disassembly, inspection, and reassembly of the pump are given. The following recommendations should be followed to insure successful repairs.

- Remove the pump from the application.
- Cleanliness is extremely important.
- Clean the port areas thoroughly before disconnecting the hydraulic lines.
- Plug the pump ports and cover the open hydraulic lines immediately after they're disconnected.
- Drain the oil and clean the exterior of the pump before making repairs.
- Wash all metal parts in clean solvent.
- Use compressed air to dry the parts. Do not wipe them dry with paper towels or cloth.
- The compressed air should be filtered and moisture free.
- Always use new seals when reassembling hydraulic pumps.
- Lubricate the new rubber seals with a petroleum jelly (Vaseline) before installation.
- Torque all bolts over gasketed joints, then repeat the torquing sequence to make-up for gasket compression.
- Verifying the accuracy of pump repairs on an authorized test stand is essential.

Identification and Tools Required

Identification Numbers - Pressure or Pressure-Flow Compensated Piston Pump

Stamped on each units mounting flange.

A - Product Number Description
  70422 = Single Piston Pump
  70452 = Single Piston Pump, w/ Aux. Flange
  70423 = Single Piston Pump
  70453 = Single Piston Pump, w/ Aux. Flange
B - Rotation
  L - Left Hand (CCW)
  R - Right Hand (CW)
C - Sequential Numbering

Single Pump - Product Number:

70423 - RAA
A B C

Serial Number Code:

B 93 01 31 JB

Revision level of parts list.
Last two digits of year built.
(93 for 1993 etc.)
Testers Initials
Day of Month (two digits)
Month (two digits)

Serial Number Code prior to Jan., 1992:

1 B- 52- JB

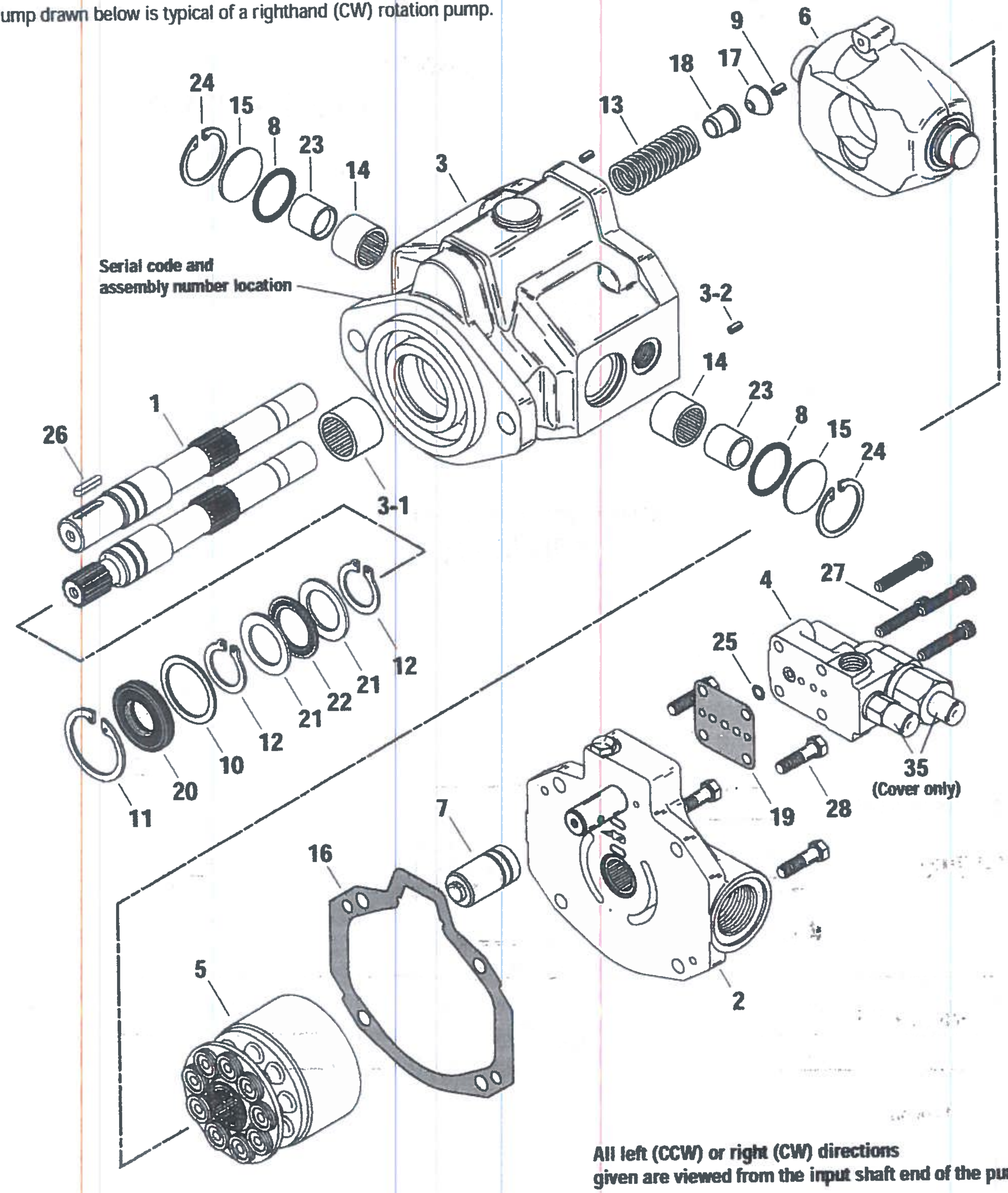
Year Manufactured
(1 for 1991 etc.)
Change Code
Testers Initials
Week of Year

Tools Required

- 9/16 Inch Socket
- 1-1/8 Inch End Wrench
- 11/16 Inch End Wrench
- Rachet Wrench
- Torque Wrench (100 lb./ft.)
- 3/16 Inch Hex Key (Allen)
- 3/16 Inch Hex Key (Allen Socket)
- Soft Face Hammer
- Internal Retaining Pliers (Straight .070 Tip)
- External Retaining Pliers (Straight .070 Tip)
- Regular or Locking Pliers
- Seal Driver or Similar Tool
- Petroleum Jelly (Such as Vaseline)
- 3/8 inch I.D. x 1-1/8 inch O.D. flat washer (2 ea.)
- 3/8 inch x 3-1/4 inch N.C. Cap screw (1 ea.)
- 3/8 inch N.C. Nut

Parts Drawing

Pump drawn below is typical of a righthand (CW) rotation pump.



All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Parts List

	Item	Part No.	Qty.	Description
	1	◆	1	Drive Shaft (Identification drawing on page #6)
	2	◆	1	Backplate Assembly (Identification drawing on page #7 & 8)
	3	◆	1	Housing Assembly (Identification drawing on page #12)
	3-1	16238-11816	1	Bearing
	3-2	16026-808	2	Roll Pin
	4	◆	1	Compensator Assembly (Identification drawing on page #9, 10, & 11)
	5	◆	1	Rotating Kit Assembly (Parts list on page #12)
	6	70423-605	1	Camplate, 0 - 38 cm^3/r [0 - 2.32 in^3/r] Displacement
	6	70423-610	1	Camplate, 0 - 45 cm^3/r [0 - 2.77 in^3/r] Displacement
	7	70421-401	1	Control Piston, 0 - 38 cm^3/r [0 - 2.32 in^3/r] Displacement
	7	70423-418	1	Control Piston, 0 - 45 cm^3/r [0 - 2.77 in^3/r] Displacement
+	8	16015-27	2	O-ring, 2.38 mm Dia. x 36.51 mm ID. [.0937 in. Dia. x 1.4375 in. ID.]
	9	16026-608	1	Roll Pin
	10	16048-319	1	Washer
+	11	16077-32	1	Retaining Ring
+	12	16078-18	2	Retaining Ring
	13	17091-14	1	Spring
	14	70412-151	2	Thrust Bearing
	15	70412-607	2	Trunnion Cover
+	16	70412-626	1	Gasket
	17	70420-35	1	Pivot Button
	18	70420-59	1	Spring Collar
+	19	70422-600	1	Gasket
+	20	16253-18	1	Shaft Seal
	20	16253-218	1	Shaft Seal, Drive (fluorocarbon rubber)
	21	74308-100	2	Thrust Bearing Race
	22	74308-101	1	Thrust Bearing
	23	70402-100	2	Inner Race
+	24	16077-26	2	Retaining Ring
+	25	16003-405-90	1	O-ring, 1.59 mm Dia. x 6.35 mm ID. [.0625 in. Dia. x .25 in. ID.]
	26	16246-516	1	Key, Used on 19.05 [.75] diameter shaft
	26	24500-619	1	Key, Used on 22.2 [.875] diameter shaft
	27	16148-412	4	Cap Screw
	28	16032-612	4	Cap Screw
	32	170142-600	1	Cover Plate (In K3 kit)
	33	16032-610	2	Cap Screw, Cover Plate (In K3 kit)
+	34	16007-14	1	O-ring, (In K2 & K3 kit)
	35	70422-618	2	Cover

Mounting Kits (Drawings and parts list on Page #13)

K2	70442-929	1	Gear Pump Mounting Kit (for "A" SAE flange)
K3	70142-915	1	Cover Plate Kit, (for "A" SAE flange)
K6	990596-000	1	Cover Plate Kit, (for "B" SAE flange)
K7	70453-901	1	Gear Pump Mounting Kit, (for "B" SAE flange)

Seal Repair Kit

•	70422-915	1	Seal Repair Kit

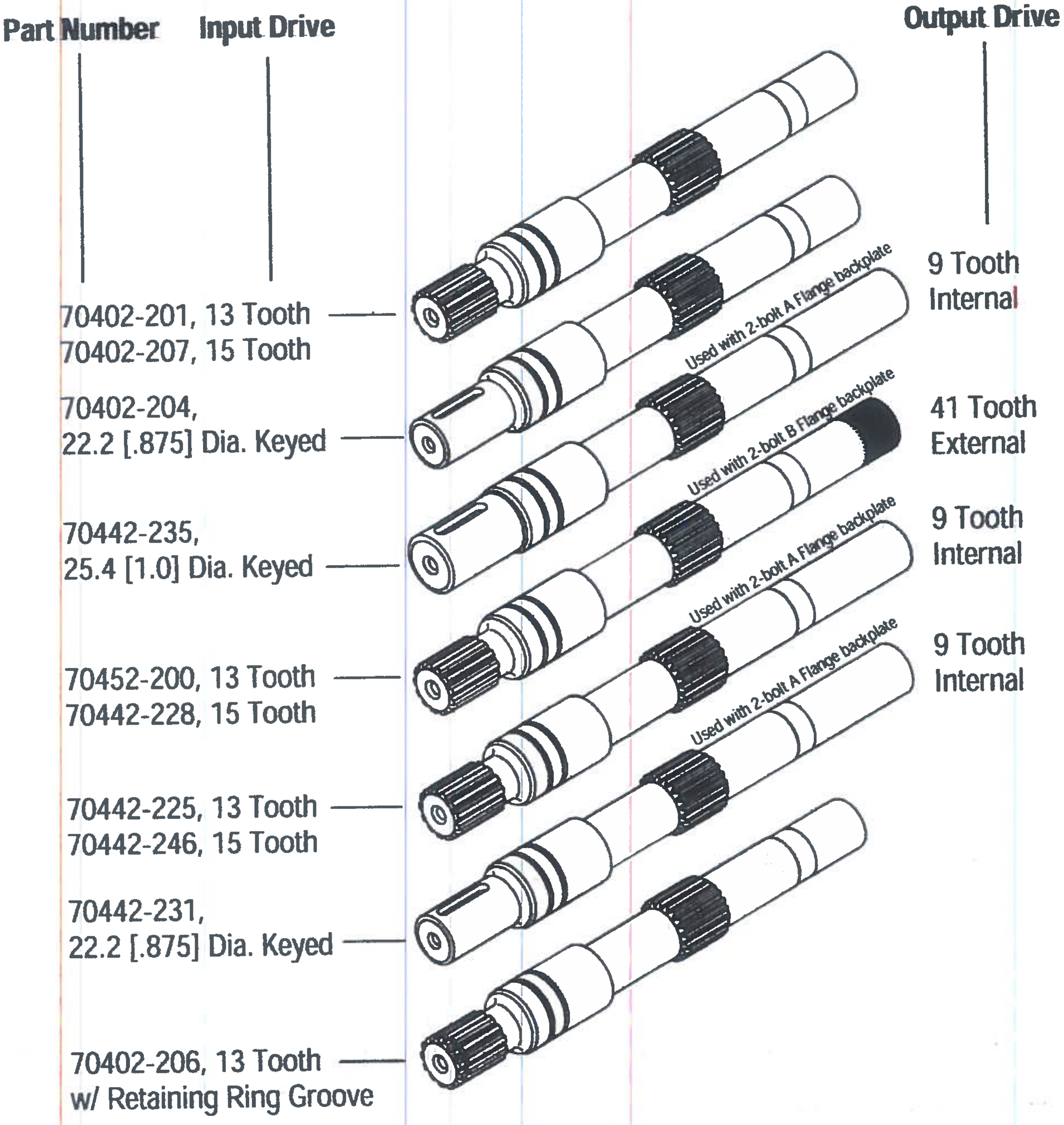
Legend

◆ Refer to specific item parts list.
+ Included in seal repair kits listed.

Item 1 - Drive Shaft Identification

Item 1

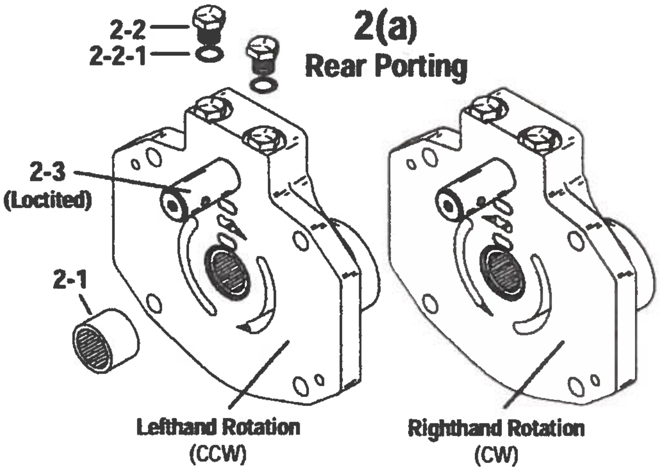
Drive Shaft Identification



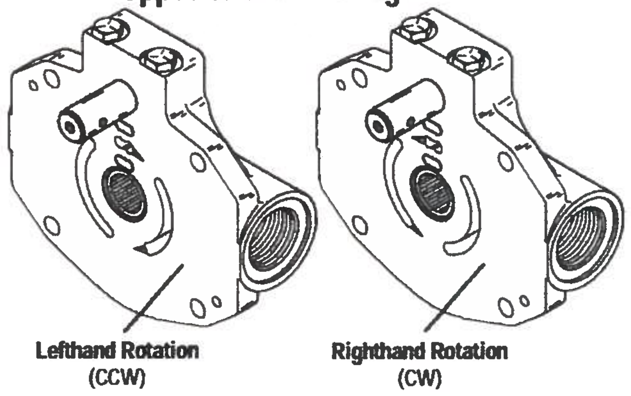
Item 2 - Model 70422 Backplate Assembly

(0 - 38 cm³/r [0 - 2.32 in³/r] Displacement)

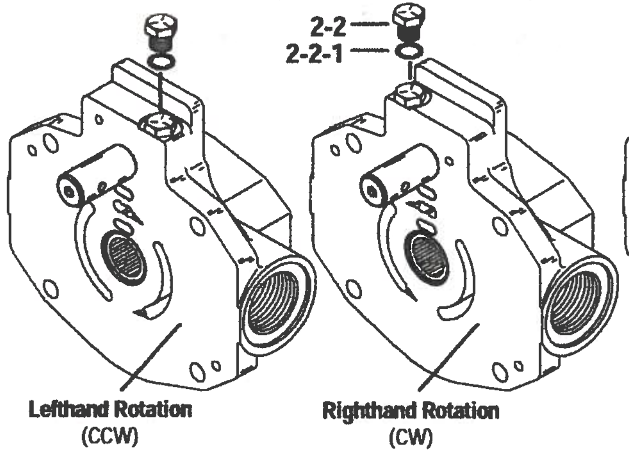
2(a)
Rear Porting



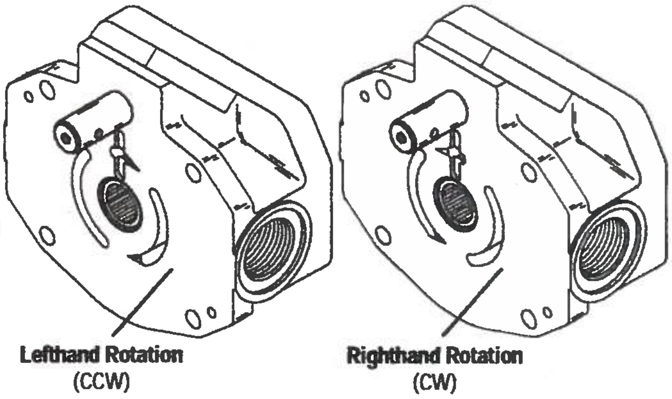
2(b)
Opposite Side Porting



2(c)
Opposite Side Porting with 2-Bolt A Flange



2(d)
Opposite Side Porting with 2-Bolt B Flange



Item 2 - Model 70422 Parts List (0 - 38 cm³/r [0 - 2.32 in³/r] Displacement)

Item	Lefthand Rotation Part No.	Righthand Rotation Part No.	Qty.	Description
2(a)	70421-318	70421-343	1	Rear Porting Backplate Assembly
2(b)	70421-327	70421-334	1	Opposite Side Porting Backplate Assembly
2(c)	70452-302	70452-304	1	Auxiliary 2-Bolt A Flange Series 82-2, Opposite Side Porting Backplate
2(d)	---	70452-317	1	Auxiliary 2-Bolt B Flange Series 101-2, Opposite Side Porting Backplate
2-1	70421-150		1	Bearing
2-2	16103-103		2	Plug Assembly
+ 2-2-1	16133-3		2	O-ring, 1.59 mm Dia. x 7.54 mm I.D. [.0625 in. Dia. x .2969 in. I.D.]
2-3	70422-428		1	Guide Pin

Legend + Included in seal repair kit listed on page 7.

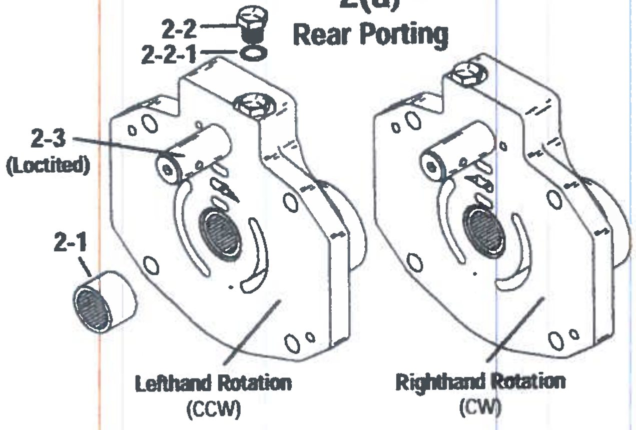
All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Item 2 - Model 70423 Backplate Assembly

(0 - 45 cm^3/r [0 - 2.77 in^3/r] Displacement)

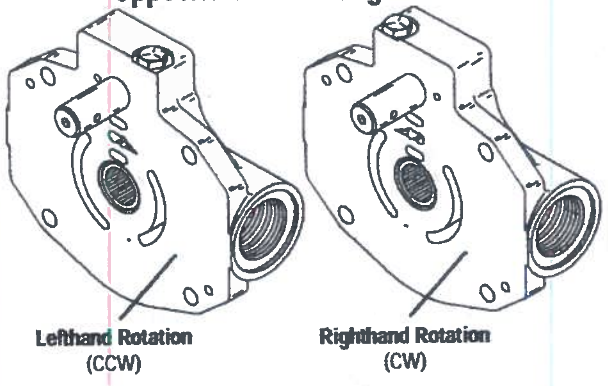
2(a)

Rear Porting



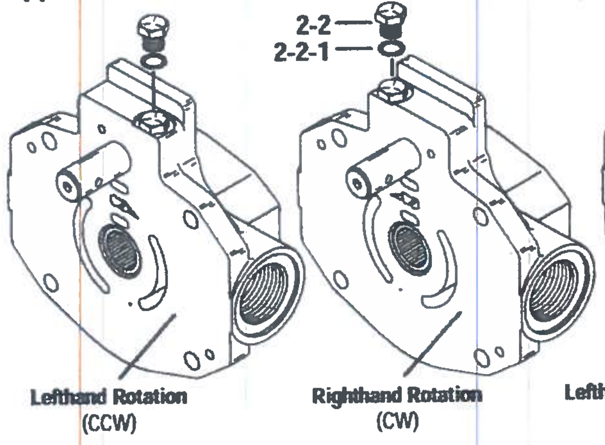
2(b)

Opposite Side Porting



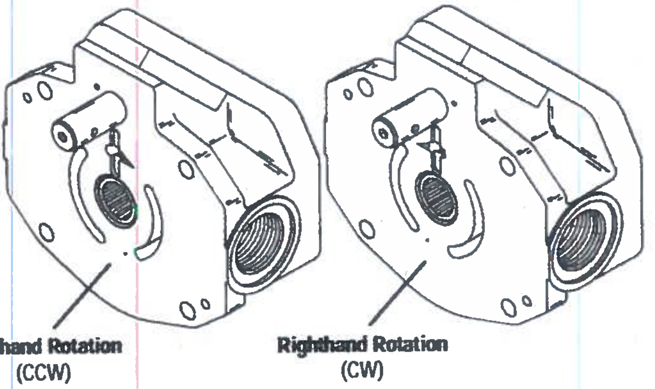
2(c)

Opposite Side Porting with 2-Bolt A Flange



2(d)

Opposite Side Porting with 2-Bolt B Flange



Item 2 - Model 70423 Parts List (0 - 45 cm^3/r [0 - 2.77 in^3/r] Displacement)

Item	Lefthand Rotation Part No.	Righthand Rotation Part No.	Qty.	Description
2(a)	70423-303	70423-301	1	Rear Porting Backplate Assembly
2(b)	70423-306	70423-312	1	Opposite Side Porting Backplate Assembly
2(c)	70453-301	70453-303	1	Auxiliary 2-Bolt A Flange Series 82-2, Opposite Side Porting Backplate
2(d)	---	70453-307	1	Auxiliary 2-Bolt B Flange Series 101-2, Opposite Side Porting Backplate
2-1	70421-150		1	Bearing
2-2	16103-103		2	Plug Assembly
+ 2-2-1	16133-3		2	O-ring, 1.59 mm Dia. x 7.54 mm I.D. [.0625 in. Dia. x .2969 in. I.D.]
2-3	70422-428		1	Guide Pin

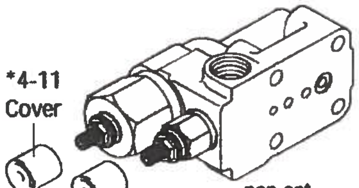
Legend + Included in seal repair kit listed on page 5.

All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

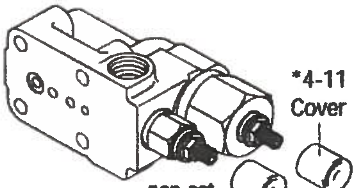
Item 4 - Compensator Assembly

Pressure-Flow Compensator

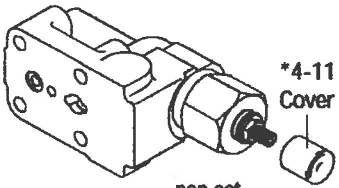
Pressure Compensator



non-set
4(a) 70422-HU
Lefthand (CCW) **Pump Rotation**

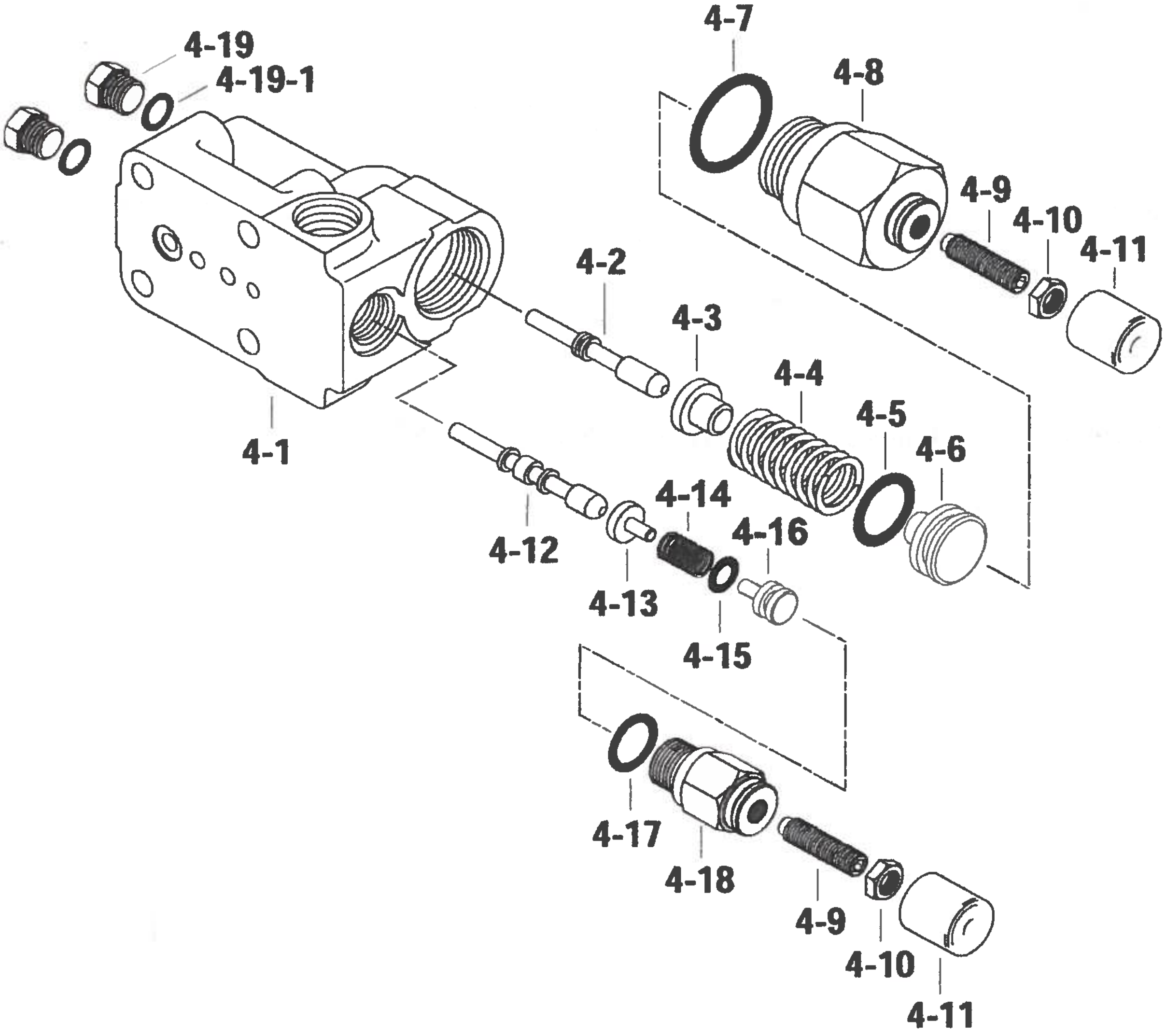


non-set
4(b) 70422-HY
Righthand (CW) **Pump Rotation**



non-set
4(c) 70422-HR
Fits Both Pump Rotations
(Righthand (CW) rotation shown)

*4-11, Cover not included with non-set compensator assy.



Item 4 - Compensator Parts List

Item 4 - Parts List (Refer to drawings)

	Item	Part No.	Qty.	Description
	4(a)	70422-HU	1	Non-Set Pressure-Flow Compensator Assembly, Lefthand Rotation
	4(b)	70422-HY	1	Non-Set Pressure-Flow Compensator Assembly, Righthand Rotation
	4(c)	70422-HR	1	Non-Set Pressure Compensator Assembly
	4-1	N/S	1	Compensator Body
	4-2	N/S	1	Pressure Spool
	4-3	70422-405	1	Spring Pivot Cap
	4-4	17063-11	1	Spring
+	4-5	16003-11	1	O-ring, 2.38 mm Dia. x 14.29 mm I.D. [.0937 in. Dia. x .5625 in. I.D.]
	4-6	70421-453	1	Pressure Spring Follower
+	4-7	16015-18	1	O-ring, 2.38 mm Dia. x 22.23 mm I.D. [.0937 in. Dia. x .875 in. I.D.]
	4-8	70422-606	1	Adjustment Cap, Pressure
	4-9	70422-620	1or2	Set Screw
	4-10	16024-4	1or2	Nut
	4-11*	70422-618*	1or2	Cover*
	4-12	N/S	1	Flow Spool
	4-13	70411-411	1	Spring Pivot Cap
	4-14	17029-5	1	Spring
+	4-15	16003-4-90	1	O-ring, 1.59 mm Dia. x 5.55 mm I.D. [.0625 in. Dia. x .2187 in. I.D.]
	4-16	70421-477	1	Flow Spring Follower
+	4-17	16133-6	1	O-ring, 1.98 mm Dia. x 11.89 mm I.D. [.078 in. Dia. x .468 in. I.D.]
	4-18	70422-602	1	Adjustment Cap Flow
	4-19	16103-103	2	Plug Assembly
+	4-19-1	16133-3	2	O-ring, 1.59 mm Dia. x 7.54 mm I.D. [.0625 in. Dia. x .2969 in. I.D.]

Legend + Included in seal repair kit listed on page 5.
NSS Not Sold Separately

* Covers are not included with Non-Set Compensator

Factory Pre-set Compensator Assemblies listed on page #11.

Factory Pre-set Compensator Assemblies

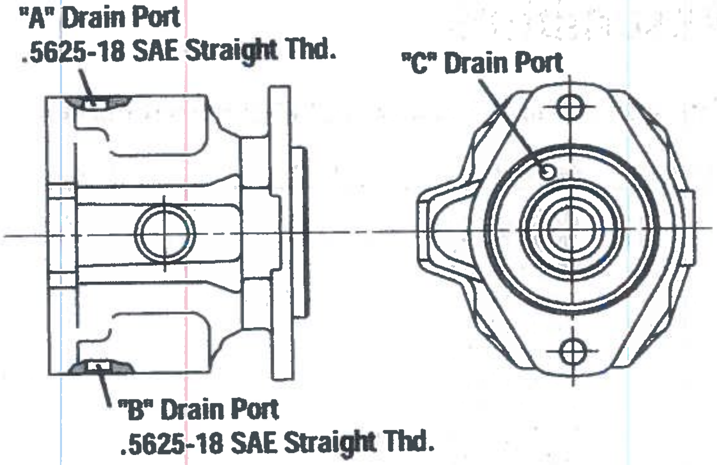
Pre-set Pressure-Flow Compensator Assemblies

Non-Set Assembly	Pre-set Assembly	Pump Rotation	Pressure Setting	Flow Setting
70422-HU	**70422-AY-03**	Lefthand (CCW)	210±3.5 bar [3050±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HU	**70422-BH-03**	Lefthand (CCW)	191±2.1 bar [2770±30 lbf/in^2]	15.2±0.7 bar [220±10 lbf/in^2]
70422-HU	**70422-BL-03**	Lefthand (CCW)	183±3.5 bar [2650±50 lbf/in^2]	25.2±1.8 bar [365±25 lbf/in^2]
70422-HU	**70422-DE-03**	Lefthand (CCW)	193±3.5 bar [2800±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HU	**70422-DU-03**	Lefthand (CCW)	176±3.5 bar [2550±50 lbf/in^2]	19.0±1.8 bar [275±25 lbf/in^2]
70422-HU	**70422-EQ-03**	Lefthand (CCW)	210±3.5 bar [3050±50 lbf/in^2]	25.9±1.8 bar [375±25 lbf/in^2]
70422-HU	**70422-GD-03**	Lefthand (CCW)	176±3.5 bar [2550±50 lbf/in^2]	17.2±1.8 bar [250±25 lbf/in^2]
70422-HU	**70422-GN-03**	Lefthand (CCW)	155±3.5 bar [2250±50 lbf/in^2]	19.0±1.8 bar [275±25 lbf/in^2]
70422-HU	**70422-GP-03**	Lefthand (CCW)	169±3.5 bar [2450±50 lbf/in^2]	19.0±1.8 bar [275±25 lbf/in^2]
70422-HU	**70422-HL-03**	Lefthand (CCW)	210±3.5 bar [3050±50 lbf/in^2]	24.5±1.0 bar [355±15 lbf/in^2]
70422-HY	**70422-BM-01**	Righthand (CW)	210±3.5 bar [3050±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HY	**70422-BU-01**	Righthand (CW)	131±3.5 bar [1900±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HY	**70422-DB-01**	Righthand (CW)	238±3.5 bar [3450±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HY	**70422-DJ-01**	Righthand (CW)	210±3.5 bar [3050±50 lbf/in^2]	25.9±1.8 bar [375±25 lbf/in^2]
70422-HY	**70422-DW-01**	Righthand (CW)	155±3.5 bar [2250±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HY	**70422-ED-01**	Righthand (CW)	169±3.5 bar [2450±50 lbf/in^2]	19.0±1.8 bar [275±25 lbf/in^2]
70422-HY	**70422-ET-01**	Righthand (CW)	176±3.5 bar [2550±50 lbf/in^2]	13.8±0.7 bar [200±10 lbf/in^2]
70422-HY	**70422-EZ-01**	Righthand (CW)	176±3.5 bar [2550±50 lbf/in^2]	17.2±0.7 bar [250±10 lbf/in^2]
70422-HY	**70422-FB-01**	Righthand (CW)	191±2.1 bar [2770±30 lbf/in^2]	15.2±0.7 bar [220±10 lbf/in^2]
70422-HY	**70422-FL-01**	Righthand (CW)	193±3.5 bar [2800±50 lbf/in^2]	20.7±1.0 bar [300±15 lbf/in^2]
70422-HY	**70422-FR-01**	Righthand (CW)	210±3.5 bar [3050±50 lbf/in^2]	19.0±1.8 bar [275±25 lbf/in^2]
70422-HY	**70422-GA-01**	Righthand (CW)	172±3.5 bar [2500±50 lbf/in^2]	20.7±0.7 bar [300±10 lbf/in^2]
70422-HY	**70422-GR-01**	Righthand (CW)	193±3.5 bar [2800±50 lbf/in^2]	17.2±1.8 bar [250±25 lbf/in^2]
70422-HY	**70422-GU-01**	Righthand (CW)	210±3.5 bar [3050±50 lbf/in^2]	17.2±1.8 bar [250±25 lbf/in^2]
70422-HY	**70422-HK-01**	Righthand (CW)	210±3.5 bar [3050±50 lbf/in^2]	24.5±1.0 bar [355±15 lbf/in^2]
70422-HY	**70422-HM-01**	Righthand (CW)	176±3.5 bar [2550±50 lbf/in^2]	24.5±1.0 bar [355±15 lbf/in^2]

Pre-set Pressure Compensator Assembly

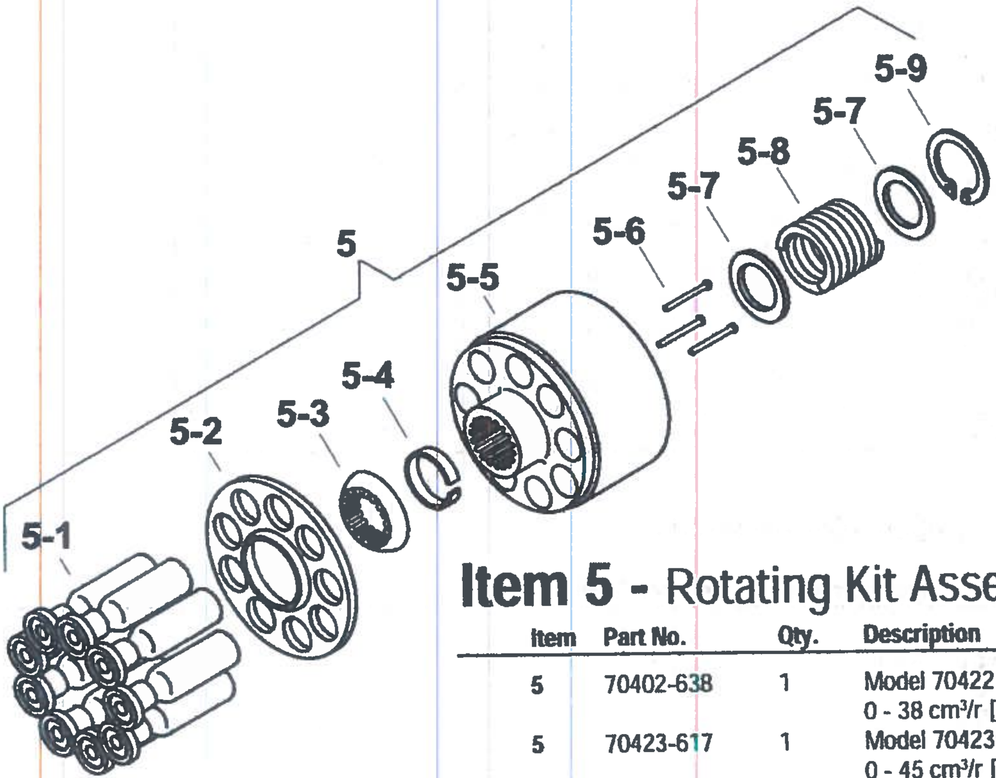
Non-Set Assembly	Pre-set Assembly	Pump Rotation	Pressure Setting
70422-HR	**70422-CA-04**	Both	210±3.5 bar [3050±50 lbf/in^2]
70422-HR	**70422-CH-04**	Both	162±3.5 bar [2350±50 lbf/in^2]
70422-HR	**70422-CK-04**	Both	148±3.5 bar [2150±50 lbf/in^2]
70422-HR	**70422-CL-04**	Both	141±3.5 bar [2050±50 lbf/in^2]
70422-HR	**70422-CR-04**	Both	107±3.5 bar [1550±50 lbf/in^2]
70422-HR	**70422-DH-04**	Both	176±1.8 bar [2550±25 lbf/in^2]
70422-HR	**70422-FG-04**	Both	159±3.5 bar [2300±50 lbf/in^2]
70422-HR	**70422-GE-04**	Both	169±1.8 bar [2450±25 lbf/in^2]
70422-HR	**70422-HB-04**	Both	190±3.5 bar [2750±50 lbf/in^2]
70422-HR	**70422-HE-04**	Both	110±3.5 bar [1600±50 lbf/in^2]
70422-HR	**70422-HN-04**	Both	114±1.8 bar [1650±25 lbf/in^2]

Item 3 - Housing Identification



Item 3
Housing Identification

Item	Part No.	Port Machined
3	70402-304	A
	70402-310	C
	70402-336	B
	70402-371	A, B



Item 5 - Rotating Kit Assembly

Item	Part No.	Qty.	Description
5	70402-638	1	Model 70422 Rotating Kit Assembly 0 - 38 cm³/r [0 - 2.32 in³/r] Disp.
5	70423-617	1	Model 70423 Rotating Kit Assembly 0 - 45 cm³/r [0 - 2.77 in³/r] Disp.
5-1	NSS	9	Piston Assembly
5-2	NSS	1	Spider
5-3	NSS	1	Spider Pivot
5-4	NSS	1	Retainer
5-5	NSS	1	Piston Block
5-6	NSS	3	Pins
5-7	NSS	2	Washer
5-8	NSS	1	Spring
5-9	NSS	1	Retaining Ring

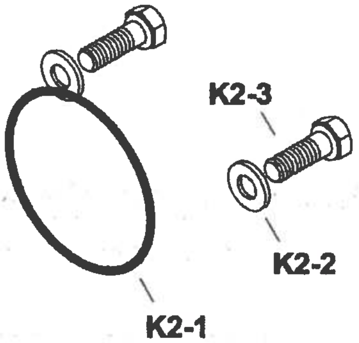
NSS - Not Sold Separately

Mounting Kits

Kit 2, Gear Pump Mounting

(To Mount "A" SAE flanges)

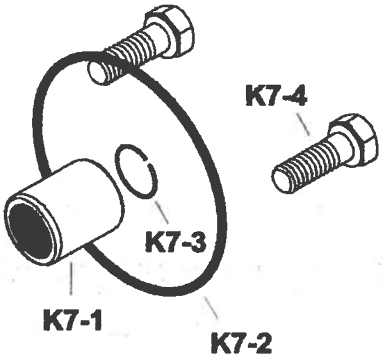
Item	Part No.	Qty.	Description
K2	70442-929	1	Gear Pump Mounting Kit
K2-1	16007-14	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K2-2	16048-113	2	Washer
K2-3	16032-612	2	Cap Screws



Kit 7, Gear Pump Mounting

(To Mount "B" SAE flanges)

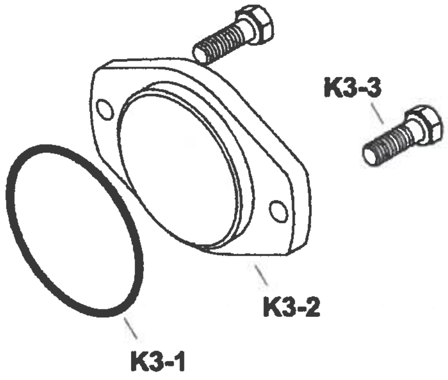
Item	Part No.	Qty.	Description
K7	70423-901	1	Gear Pump Mounting Kit
K7-1	70423-615	1	Coupler, 41 Tooth
K7-2	16007-17	1	O-ring, 1.59 mm Dia. x 101.6 mm ID. [.0625 in. Dia. x 4 in. ID.]
K7-3	16008-0	1	Lock Ring
K7-4	16032-814	2	Cap Screws



Kit 3 & 6, Cover Plates

For "A" SAE Flanges

Item	Part No.	Qty.	Description
K3	70142-915	1	Cover Plate Kit for "A" SAE flange
K3-1	16007-14	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K3-2	70142-600	1	Cover Plate
K3-3	16032-610	2	Cap Screws



For "B" SAE Flanges (Not Pictured)

Item	Part No.	Qty.	Description
K6	990596-000	1	Cover Plate Kit for "B" SAE flange
K6-1	102919-000	1	Gasket
K6-2	250073-000	1	Cover Plate
K6-3	95865-100	2	Cap Screws
K6-4	101896-050	2	Lock Washer

Product Number

This list of product numbers is to aid in Item identification.
If your product number is not listed contact your Eaton representitive.

Model 70422, Lefthand Rotation (CCW)

	Description of Part Number			
Product Number	Drive Shaft Item #1	Backplate Assy. Item #2	Housing Assy. Item #3	Compensator Assy. Item #4
70422-LAG	70402-206	70421-318	70402-304	70422-CA-04
70422-LAH	70402-206	70421-318	70402-304	70422-AY-03
70422-LAY	70402-204	70421-318	70402-304	70422-CA-04
70422-LAZ	70402-204	70421-318	70402-304	70422-AY-03
70422-LBJ	70402-206	70421-327	70402-304	70422-AY-03
70422-LBK	70402-201	70421-327	70402-304	70422-CA-04
70422-LBL	70402-204	70421-327	70402-304	70422-AY-03
70422-LBM	70402-204	70421-327	70402-304	70422-CA-04
70452-LAG	70442-225	70452-302	70402-304	70422-AY-03
70452-LAJ	70442-225	70452-302	70402-304	70422-CA-04
70452-LAK	70442-231	70452-302	70402-304	70422-AY-03

Model 70422, Righthand Rotation (CW)

	Description of Part Number			
Product Number	Drive Shaft Item #1	Backplate Assy. Item #2	Housing Assy. Item #3	Compensator Assy. Item #4
70422-RAT	70402-206	70421-343	70402-304	70422-CA-04
70422-RAU	70402-206	70421-343	70402-304	70422-BM-01
70422-RCB	70402-204	70421-343	70402-304	70422-CA-04
70422-RCG	70402-204	70421-343	70402-304	70422-BM-01
70422-RDM	70402-201	70421-334	70402-304	70422-BM-01
70422-RDN	70402-206	70421-334	70402-304	70422-CA-04
70422-RDQ	70402-204	70421-334	70402-304	70422-CA-04
70452-RAG	70442-225	70452-304	70402-304	70422-BM-01
70452-RAJ	70442-231	70452-304	70402-304	70422-CA-04
70452-RAL	70442-231	70452-304	70402-304	70422-BM-01

All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Product Number

This list of product numbers is to aid in Item identification.
If your product number is not listed contact your Eaton representitive.

Model 70423, Lefthand Rotation (CCW)

Product Number	Description of Part Number Drive Shaft Item #1	Backplate Assy. Item #2	Housing Assy. Item #3	Compensator Assy. Item #4
70423-LBA	70402-204	70423-303	70402-304	70422-AY-03
70423-LBB	70402-201	70423-306	70402-304	70422-CA-04
70423-LBD	70402-204	70423-306	70402-304	70422-CA-04
70423-LBE	70402-204	70423-306	70402-304	70422-AY-03
70423-LBF	70402-201	70423-303	70402-304	70422-CA-04
70423-LBG	70402-201	70423-303	70402-304	70422-AY-03
70453-LAF	70402-207	70453-301	70402-304	70422-AY-03
70453-LAG	70402-207	70453-301	70402-304	70422-CA-04

Model 70423, Righthand Rotation (CW)

Product Number	Description of Part Number Drive Shaft Item #1	Backplate Assy. Item #2	Housing Assy. Item #3	Compensator Assy. Item #4
70423-RBL	70402-204	70423-301	70402-304	70422-CA-04
70423-RBM	70402-204	70423-301	70402-304	70422-BM-01
70423-RBN	70402-201	70423-312	70402-304	70422-CA-04
70423-RBQ	70402-204	70423-312	70402-304	70422-CA-04
70423-RBS	70402-201	70423-301	70402-304	70422-CA-04
70423-RBT	70402-201	70423-301	70402-304	70422-BM-01
70453-RAG	70442-246	70453-303	70402-371	70422-BM-01
70453-RAJ	70442-235	70453-303	70402-371	70422-CA-04

All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Repair Information

Cleanliness is extremely important when repairing these pumps. Work in a clean area. Before disconnecting the lines clean port area of pump. Disconnect hydraulic lines and remove pump assembly from vehicle and plug ports. Thoroughly clean the outside of pump. After cleaning, remove port plugs and drain oil.

Disassembly

ATTENTION: Removal of the adjusting screw covers from cap may void the warranty on this assembly.

1 Clamp the end of the drive shaft in a protected jaw vise with the body of the pump up and remove the four allen head screws (14) holding compensator (4).

2 Remove the compensator assembly (4), O-ring (28), and gasket (24).

3 Remove the four cap screws (27) from the backplate of the pump.

4 Place a screw driver in slots provided between housing and loosen backplate. Remove backplate (2) and gasket (21) from housing.

5 Remove the control piston (7) remaining on the backplate or in housing. Also remove plug (2-2) from backplate (2).

6 To remove rotating assembly (5) from housing, remove pump from vise and slide rotating assembly off shaft. Caution: pistons may not come out with piston block.

7 Remove pistons (5-1), spider (5-2), and spider pivot (5-3) from piston block (5-5).

8 The piston block assembly (5-5) need not be disassembled unless the internal pins (5-6) or spring (5-8) are damaged.

CAUTION: Use the following procedure if the spring is to be removed from the piston block. The spring (5-8) is highly compressed and the snap ring (5-9) should not be removed without compressing the spring.

The following parts will be needed to disassemble the piston block:

2 ea. 3/8 I.D. x 1-1/8 O.D. flat washer,
1 ea. 3/8 x 3-1/4 N.C. cap screw, and
1 ea. 3/8 N.C. nut.

Place one of the flat washers over the 5/16 cap screw and place this through the center of the piston block. Place the other washer over the cap screw and let it rest on the three pins. Screw the nut on and compress the spring inside the piston block. Use a pair of snap ring pliers and remove the internal snap ring (5-9). Remove the nut and bolt along with the two washers (5-7), three pins (5-6), and the internal pin keeper (5-4).

9 To free shaft seal and shaft, remove retaining ring (12).

10 Remove shaft (1) from housing (3) by tapping backplate end of shaft with a wooden or plastic mallet.

11 Remove shaft seal (17), washer (13), the two retaining rings (10), the two thrust washers (16), and bearing (15) from shaft.

12 To remove the camplate (6) from the housing, remove the two internal retaining rings (11) from the sides of the housing. Remove the two covers (20), the two o-rings (26), the two inner races (19), and the bearings (25). The camplate can now be moved over to one side and removed. The two camplate pivot bearings are a loose slip fit into the housing. Do not be concerned if they are not tight.

13 Remove the spring collar (22) and spring (18). Do not remove the button (23) and roll pin (9) unless they are worn or loose.

14 The pressure-flow compensator assembly (4) may be disassembled for cleaning and inspection.

Repair Information

ATTENTION: Removal of the adjusting screw covers from cap may void the warranty on this assembly.

15 Remove pressure adjustment cap (4-8) from compensator housing (4-1). Pressure spring follower (4-6) will remain in cap (4-8), pull follower from cap.

16 Remove flow adjustment cap (4-18) from compensator housing (4-1). Flow spring follower (4-16) will remain in cap (4-18). Pull follower from cap.

17 Remove springs (4-4 and 4-14) and spring pivots (4-3 and 4-13) from compensator housing.

18 Remove plugs (4-19), pressure compensator spool (4-2), and flow compensator spool (4-12) from compensator housing (4-1).

19 The shaft seal, all O-rings, and all gaskets should be removed and replaced with new items upon reassembly.

Inspect Parts For Wear

1 Inspect the flat surface of the backplate (2), the finish on the piston block side should be smooth and free of grooves. The piston guide should be tight in the backplate. The needle bearing in the backplate should be free of excessive play and remain in the bearing cage. If the backplate has any of the wear characteristics outlined above, replace complete backplate assembly.

2 Inspect the piston block (5). The surface that contacts the backplate should be smooth and free of grooves.

3 The pistons (5-1) should move freely in the piston block bore. If they stick in the bore, examine the bore for scoring or contamination.

4 Examine the O.D. of the piston (5-1) for finish condition. They should not show wear or deep scratches. The shoes should be a snug fit on the ball end of the piston. The flat surface of the shoes should be flat, and smooth. Do not lap piston shoes.

5 Examine the spider (5-2). It should be flat, no cracks, and no signs of wear in the pivot area.

6 Examine the pivot (5-3). It should be smooth and show no signs of wear.

7 Inspect the camplate (6) for the condition of finish of the polished shoe surface. It should show no signs of scoring.

8 Inspect shaft (1) for wear in bearing and spline areas.

9 Inspect thrust bearing (15) and thrust washers (16) for wear.

10 Inspect the needle bearing in the housing assembly (3). If the needles are free of excessive play and remain in the bearing cage, there is no need to replace the housing.

11 Inspect the compensator springs (4-4 and 4-14) for breakage or weakness.

12 Inspect the spools (4-2 and 4-12) for scoring.

13 It is not necessary to inspect the o-rings, retaining rings, gaskets, or shaft seal as they should be replaced as new items and are included in the seal repair kit available for this assembly.

Reassembly

1 Clean all parts in suitable solvent; lubricate all critical moving parts before reassembly.

2 Install camplate control spring (18) and spring collar (22) in housing (3).

3 Insert camplate (6) into housing (3). Insert needle bearings (25) and bearing inner race (19) over the camplate arms and slide into housing (3). The numbered end of the bearing should face outward and the chamfered I.D. of the race should face inward.

4 Install new O-ring (26) around O.D. of camplate

Repair Information

pivot bearing (25). Install trunnion covers (20) and secure with retaining rings (11).

5 Install retaining ring (10) on shaft (1). Install thrust washer (16), thrust bearing (15), and second thrust washer (16). Secure with second retaining ring (10).

6 Install shaft (1) in housing (3) and install washer (13), shaft seal (17), and retain with retaining ring (12). Make sure retaining ring is seated in the groove.

7 If piston block assembly was disassembled, compress the pin keeper (5-4), and install in the spline area of piston block. Install the three pins (5-6) with the head end to the inside of the block and install in the special grooves of the piston block spline.

8 Install the washer (5-7), spring (5-8), and second washer (5-7) in the piston block. Use the two 3/8 I.D. washers and the 3/8 x 3-1/4 cap screw to compress the spring and retain with retaining ring (5-9). Remove the 3/8 cap screw and the two washers.

9 Install the pivot (5-3), spider (5-2), and piston assemblies (5-1) in the piston block. Install this assembly in the housing assembly, the piston shoes must be in contact with the camplate. Be sure all the parts are in their proper position.

10 Clamp this assembly in a protected jaw vise with the open end of the housing (3) up.

11 Install new gasket (21).

12 Install control piston (7), and plug (2-2) with new o-ring onto backplate. Note roll pin (3-2) locations.

13 Install backplate (2) and retain with cap screws (27). Torque to 37 to 42 N-m [27 to 31 lb-ft].

14 Place new o-ring (4-19-1) on plug (4-19). Install plug assembly, flow compensator spool (4-12), spring pivot (4-13), spring (4-14), flow spring follower (4-16) with new o-ring (4-15), and flow adjustment cap (4-18) with new o-ring (4-17) into compensator housing (4-1). Torque plug (4-19) 8 to 11 N-m [6 to 8 lb-ft] and torque flow adjustment cap (4-18) 14 to 16 N-m [10 to 12 lb-ft].

15 Place new 0-ring (4-19-1) on plug (4-19). Install plug assembly, pressure compensator spool (4-2), spring pivot (4-3), spring (4-4), pressure spring follower (4-6) with new o-ring (4-5), and pressure adjustment cap (4-8) with new o-ring (4-7) into compensator housing (4-1). Torque plug (4-19) 8 to 10 N-m [6 to 8 lb-ft] and torque pressure adjustment cap (4-18) 47 to 54 N-m [35 to 40 lb-ft].

16 Install new gasket (24) and new o-ring (28), then install compensator assembly (4),and retain with four allen head cap screws (14) and torque to 14 to 16 N-m [10 to 12 lb-ft].

17 Plug ports to preserve cleanliness until installation on vehicle. (Refer to start up procedures.)

Start - up Procedure

When initially starting a rebuilt load sensing system, it is extremely important that the start-up procedure be followed. It prevents the chance of damaging the pump which might occur if the system was not properly purged with oil before start-up.

1 After the pump has been properly installed onto the machine and all hydraulic connections have been made, check all fittings to make sure that they are tight.

2 Fill the pump housing at least 1/2 full with system oil that has been filtered through a 10 micron filter.

3 Fill the reservoir with an approved oil that has been filtered through a 10 micron filter. Leave the filler cap loose as a means of air that is trapped in the system.

4 Note on gasoline or L.P. engines: remove the coil wire and turn the engine over for 15 seconds. Diesel engines: shut off the fuel flow to the injectors and turn the engine over for 15 seconds. This procedure enables the pump to pick-up the oil before start-up. At this time disconnect the sensor line from the pump compensator and pull one of the valve spools while the engine is being turned over. This allows oil to flow through the sensor line, thus, removing any air in the sensor line. Reconnect the sensor line after a steady flow of oil is coming from the line.

5 Replace the coil wire or return the fuel flow to the injectors and start the engine. Run at low idle speed for one minute. The pump should immediately pick up oil and go into low pressure standby. If there is no indication of fill in 30 seconds, stop engine and determine the cause.

6 After the pump has stabilized in low pressure standby, operate the control valve and steering, if the system is equipped with one, to purge the system of air and to fill the cylinders with oil. Continue operating the system slowly with no load until it responds fully.

7 Check fluid level at the reservoir and refill if necessary to the proper level at the reservoir and refill if necessary to the proper level with an approved filtered oil.

8 Check all line connections for leaks tighten if necessary.

9 The machine is now ready to be put into operation.

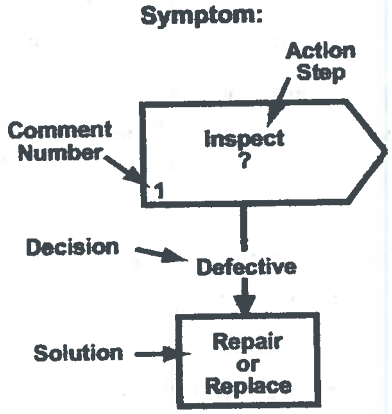
10 Short hour filter changes are recommended for the first two changes after placing the machine back into operation. The first filter would be changed in 3-5 hours and the second at approximately 50 hours. Routine scheduled filter changes are recommended for maximum life of hydraulic system.

Fault - Logic Troubleshooting

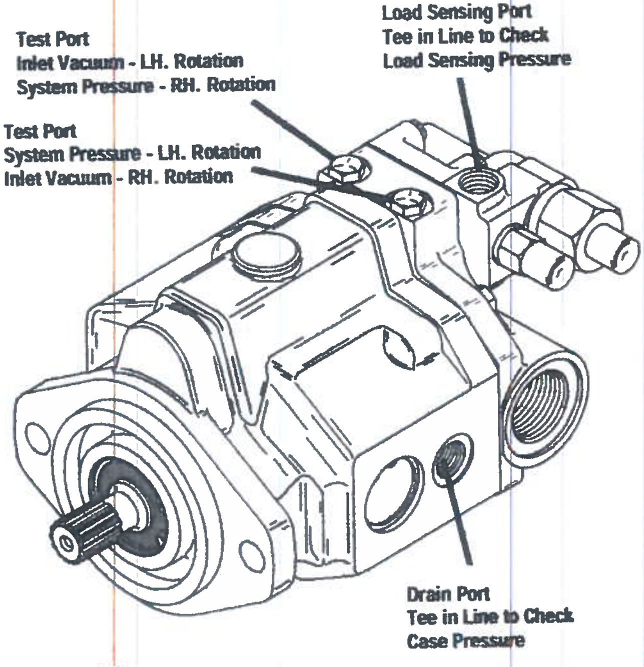
This fault - logic troubleshooting guide is a diagnostic aid in locating pump problems.

Match the pump systems with the problem statements and follow the action steps shown in the box diagrams. This will give expedient aid in correcting minor problems eliminating unnecessary machine down time.

Following the fault - logic diagrams are diagram action comments of the action steps shown in the diagrams. Where applicable, the comment number of the statement appears in the action block of the diagrams.

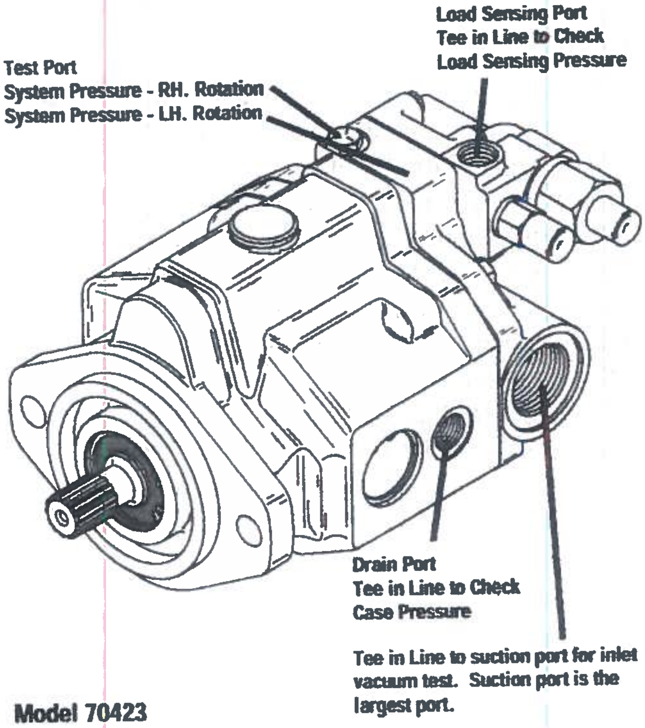


Recommended Gauge Locations



Model 70422

0 - 38 cm^3/r [0 - 2.32 in^3/r] Displacement


Test Port
System Pressure - RH. Rotation
System Pressure - LH. Rotation
Load Sensing Port
Tee in Line to Check
Load Sensing Pressure
Drain Port
Tee in Line to Check
Case Pressure
Tee in Line to suction port for inlet vacuum test. Suction port is the largest port.

Model 70423

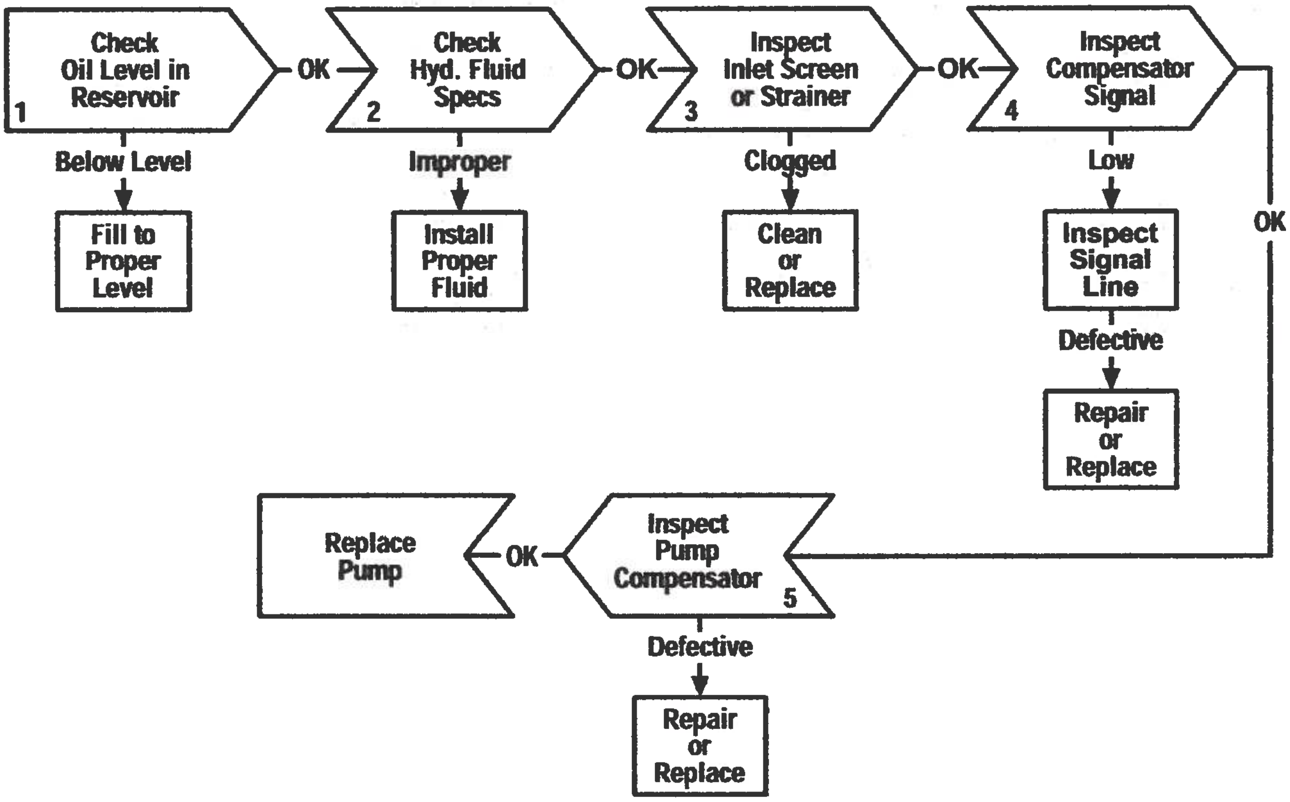
0 - 45 cm^3/r [0 - 2.77 in^3/r] Displacement

Gauges Recommended

Inlet vacuum gauge: 2 bar to 1 bar [30 PSI to 30 inHg]
System pressure gauge: 700 bar [10,000 PSI]
Case pressure gauge: 0 to 25 bar [0 to 300 PSI]

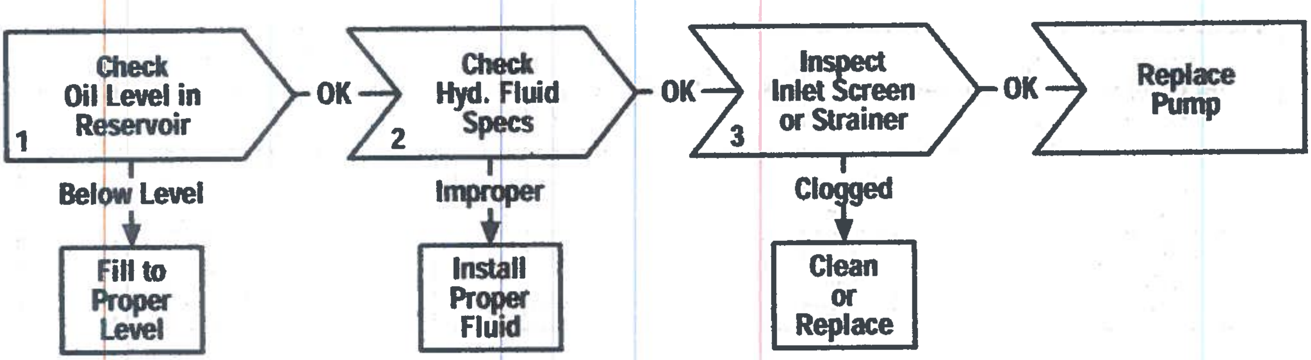
Fault - Logic Troubleshooting

Symptom: System will not Develop Proper Pressure or Flow



Fault - Logic Troubleshooting

Symptom: Pump Noisy or Overheating



Fault - Logic Troubleshooting

Diagram Action Step Comments

1. **Check Oil Level in Reservoir:**
   A. Fill to proper level.
2. **Check Hydraulic Fluid Specifications:**
   A. Consult owner/operators manual for the proper type fluid.
3. **Inspect Inlet Screen or Strainer for:**
   A. Suction screen or strainer plugged.
   B. Suction line to small or too long
   C. Suction line collapsed or plugged.
4. **Inspect Compensator Signal for:**
   A. Improper size or length of signal line.
   B. Damaged or obstructed signal line
5. ***Inspect Pump Compensator for:**
   A. Misadjusted pressure or flow setting.
   B. Pressure or flow spool stuck open.
   C. Pressure or flow spring weak or broken.

***Standard factory compensator pressure settings**
A. Pressure compensator set at 3000 to 3100 PSI
(Optional settings of 1500 min. to 3100 max. PSI)
B. Flow compensator set at 190 to 210 PSI
(Optional settings of 190 min. to 450 max. PSI)

Each order must include the following information.

1. Product and/or Part Number
2. Serial Number Code
3. Part Name
4. Quantity

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DNV

ISO-9001 CERTIFICATED FIRM

Quality System Certified
Products in this catalog are manufactured in an ISO-9001-certified site.

Form No. 6-631
May, 1993

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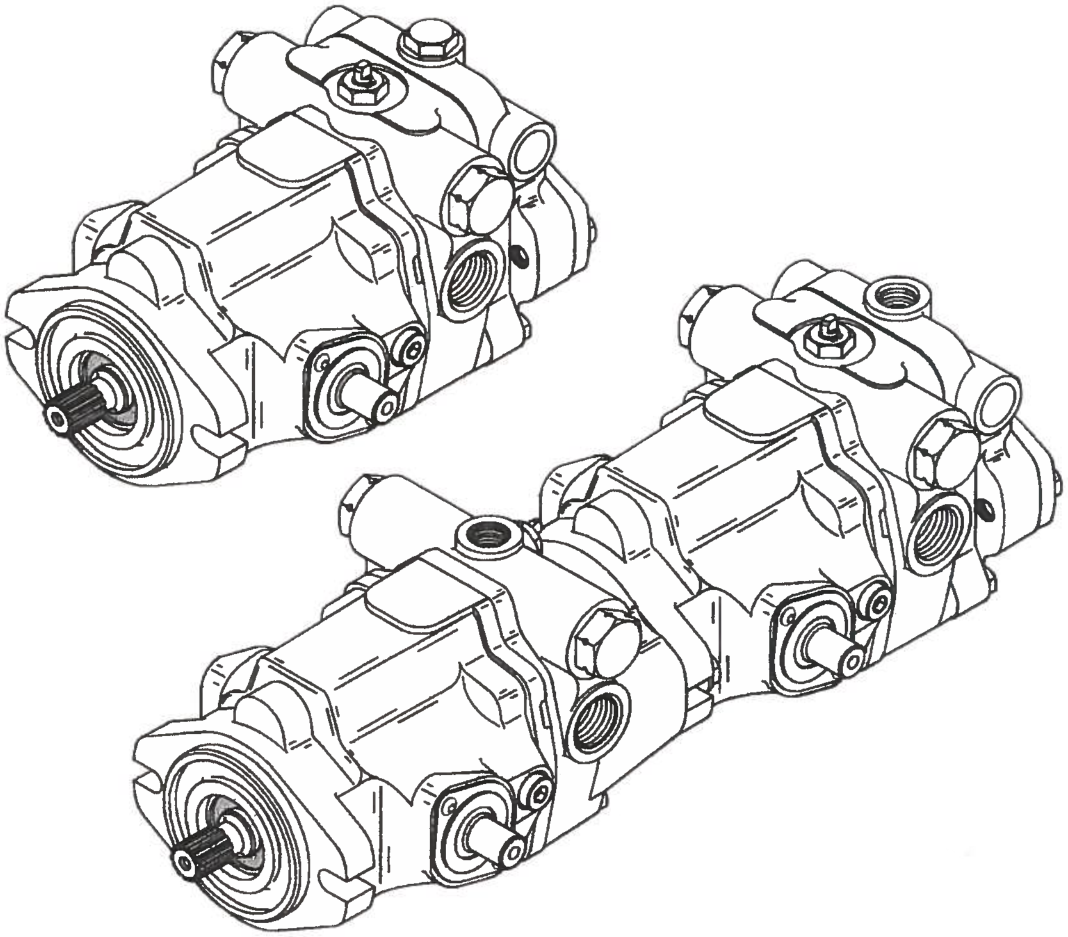
EATON

Eaton®
Medium Duty Piston Pump

No. 6-632
August, 1995

Parts Information



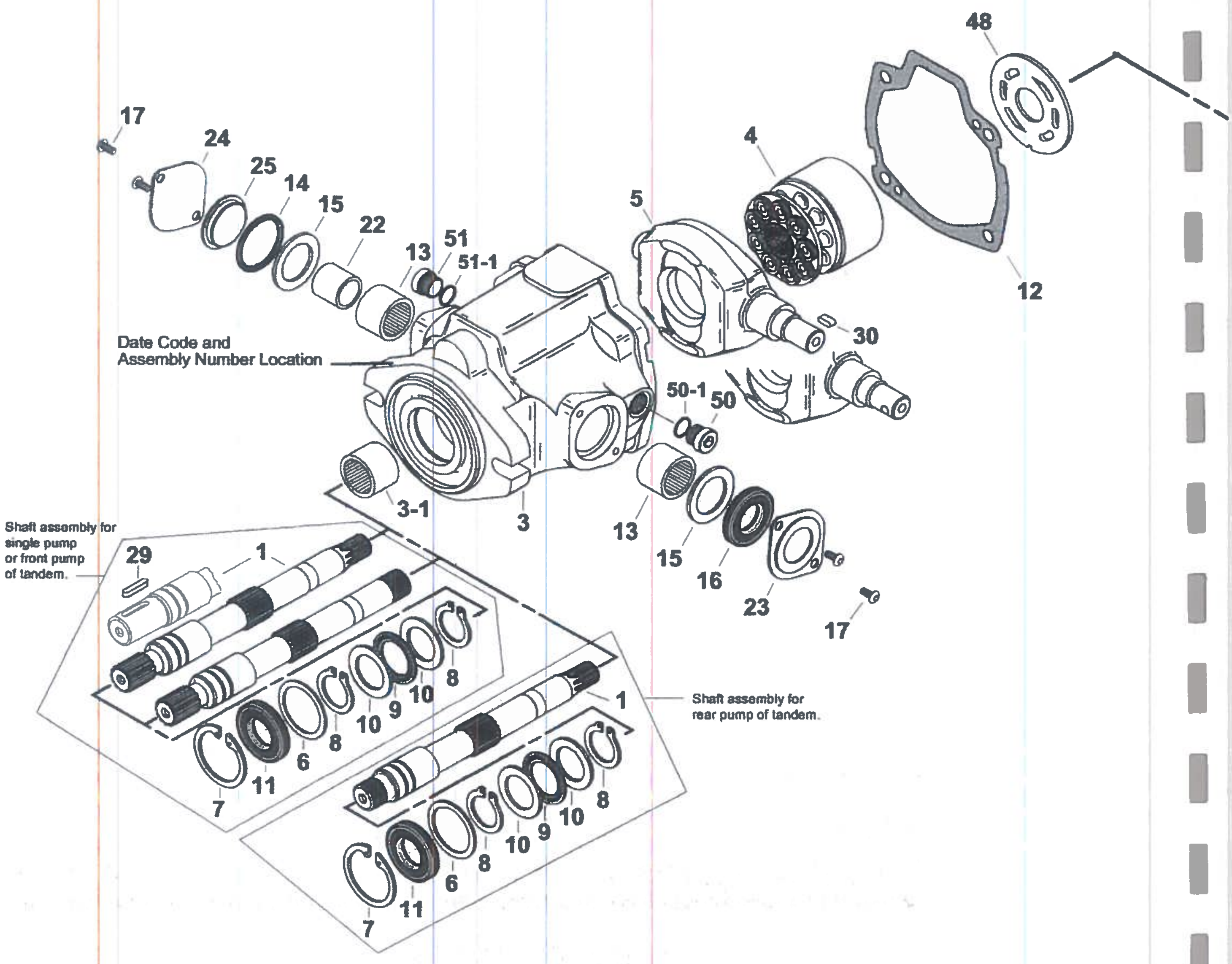
Model 70142 / 70144, 20.3 cm³/r [1.24 in³/r] Displacement
and 70145, 23.6 cm³/r [1.44 in³/r] Displacement
Variable Displacement Piston Pump

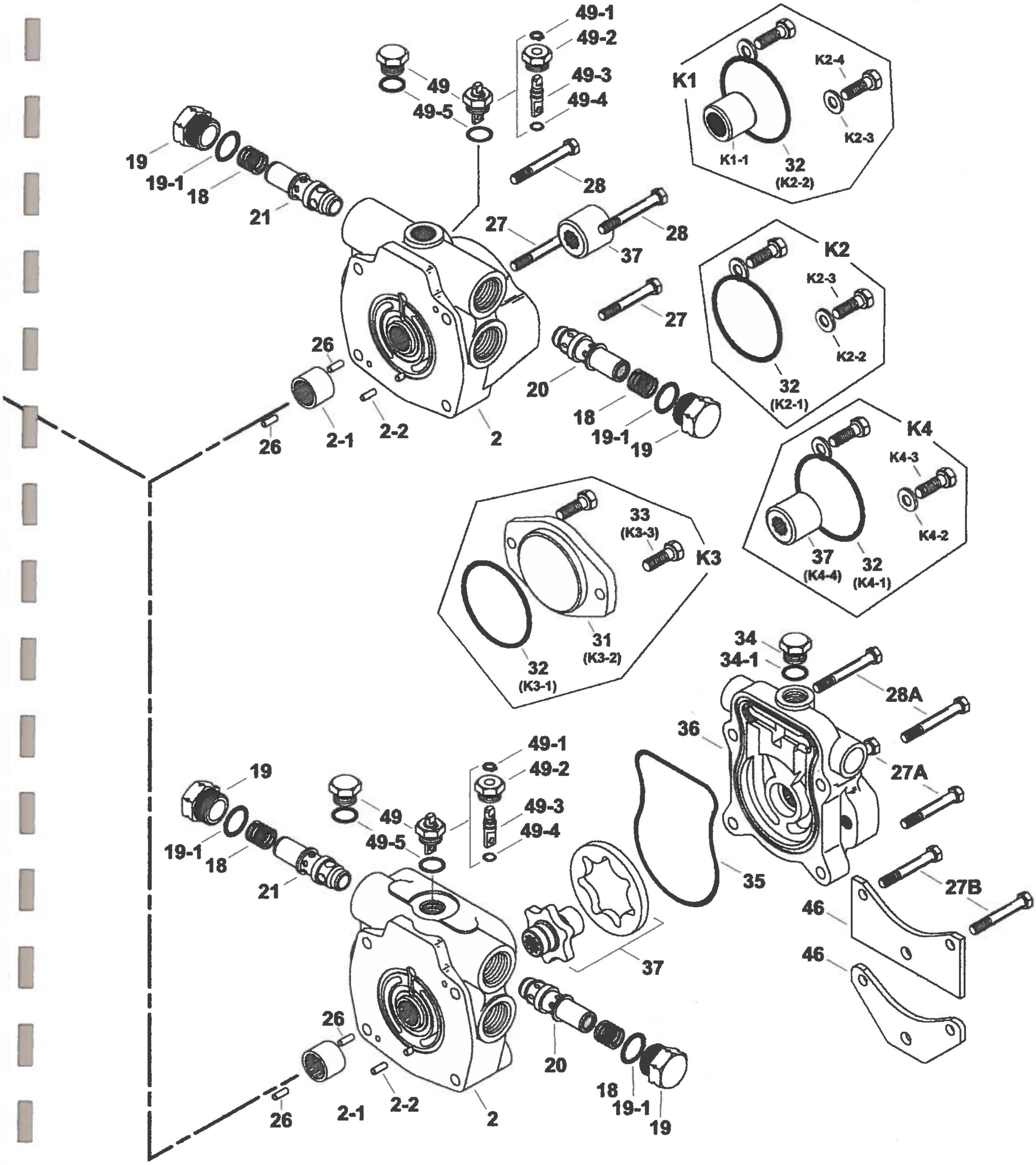
design code **01 & 02**

with Valve Plate

Parts Drawing

Pump drawn below is typical of a righthand rotation pump.


48
17
24
25
14
15
22
13
51
51-1
4
5
12
30
Date Code and Assembly Number Location
50-1
50
3-1
3
13
15
16
23
17
Shaft assembly for single pump or front pump of tandem.
29
1
8
10
9
10
8
6
11
7
1
Shaft assembly for rear pump of tandem.
8
10
9
10
8
6
11
7


49-1
49-2
49-3
49-4
49
49-5
19
19-1
18
21
27
28
28
37
K1
K1-1
K2-4
K2-3
32
(K2-2)
K2
K2-3
K2-2
32
(K2-1)
27
20
18
19-1
19
26
2-1
2-2
2
26
K4
K4-3
K4-2
37
(K4-4)
32
(K4-1)
33
(K3-3)
K3
31
(K3-2)
32
(K3-1)
34
34-1
28A
36
27A
35
27B
46
46
19
19-1
18
21
49
49-5
49-1
49-2
49-3
49-4
37
26
2-1
2-2
2
26
20
18
19-1
19

Parts List

Parts listed below are to service catalog units. Other variations of units are built that have parts altered for special requirements. The non-catalog units can be serviced with the parts list below using caution for proper identification. Contact an Eaton representative with any questions concerning your selection. Have your final assembly number ready when contacting representative.

The following design code [02] part numbers are used to service both 01 and 02 catalog units with the exception of the item 48 valve plate. (See page 9 for details)

	Item	02 Part No.	Qty.	Description
	1	◆	1	Drive Shaft (Identification drawing on page #6)
	2	◆	1	Backplate Assembly (Identification drawing and parts list on page #7)
	3	◆	1	Housing Assembly (Identification drawing on page #8)
	4	70111-692	1	Rotating Kit Assembly (parts list on page #8)
	5		1	Camplate, 20.3 cm^3/r [1.24 in^3/r] Displacement
		70111-665		Key groove in trunnion
		70111-702		Cross hole in trunnion
	5		1	Camplate, 23.6 cm^3/r [1.44 in^3/r] Displacement
		70111-683		Key groove in trunnion
		70111-705		Cross hole in trunnion
	6	16048-312	1	Washer
+	7	16077-26	1	Retaining Ring
+	8	16078-16	2	Retaining Ring
	9	16241-1625	1	Thrust Bearing
	10	16241-C1625	2	Bearing Race
+	11	16253-16	1	Shaft Seal, Drive
	11	16253-216	1	Viton Shaft Seal, Drive
+	12	70111-701	1	Housing Gasket
	13	76100-191	2	Needle Bearing
+	14	16003-23	1	O-ring, 3.175 mm Dia. x 31.75 mm ID. [.125 in. Dia. x 1.25 in. ID.]
	15	16048-534	2	Washer
+	16	16253-214	1	Shaft Seal, Trunnion
	17	16268-306	4	Screw, Pan Head
	18	17079-2	2	Spring
	19	32060-8	2	Plug Assembly
+	19-1	16015-18-90	2	O-ring, 2.38 mm Dia. x 22.23 mm ID. [.0937 in. Dia. x .875 in. ID.]
	20	◆	1	Relief Valve for Port "C" (Identification drawing on page #9)
	21	◆	1	Relief Valve for Port "D" (Identification drawing on page #9)
	22	70101-150	1	Inner Race
	23	70102-615	1	Seal Cover
	24	70102-616	1	Trunnion Cover
	25	70102-625	1	Cover, O-ring
	26	16028-304	2	Dowel Pin
	27	16032-520	2	Cap Screws, 5/16-18, 50.8 mm [2 in.] Long
	27A	16032-532	2	Cap Screws, 5/16-18, 82.6 mm [3.25 in.] Long
	27B	16032-534	2	Cap Screws, 5/16-18, 88.9 mm [3.5 in.] Long
	28	16032-524	2	Cap Screws, 5/16-18, 63.5 mm [2.5 in.] Long
	28A	16032-536	2	Cap Screws, 5/16-18, 95.3 mm [3.75 in.] Long
	29		1	Key, Drive Shaft
		24500-619		Used with 22.2 mm [.875 in] dia. drive shaft.
	30	16246-425	1	Key, Camplate Trunnion
	31	70142-600	1	Cover Plate (In K3 kit)
+	32	16007-14	1	O-ring (In K1, K2, K3, & K4 kit)
	33	16032-610	2	Cap Screws, Cover Plate (In K3 kit)
	34	16103-108	1	Plug Assembly
+	34-1	16133-8	1	O-ring, 2.21 mm Dia. x 16.36 mm ID. [.087 in. Dia. x .644 in. ID.]
+	35	70111-703	1	Molded O-ring
	36	◆	1	Charge Pump Adaptor (Identification drawing and parts list on page #10 & #11)

Parts List

Item	02 Part No.	Qty.	Description
37		1	Gerotor set and coupler sub-assembly
	70111-642		6.9 cm^3/r [.42 in^3/r] displacement, 6.35 mm [.25 in] width
	70111-646		13.8 cm^3/r [.84 in^3/r] displacement, 12.7 mm [.5 in] width
37	70111-667	1	9 tooth coupler (In Kit 4)
46	70111-632	1	Mounting Bracket, Square shaped
46	70111-709	1	Mounting Bracket, "V" shaped
48	™	1	Valve Plate (Identification drawing on page #9)
	70113-008		Righthand (CW) Rotation
	70113-009		Lefthand (CCW) Rotation
	70112-007		Low Cam Effort Valving, Righthand and Lefthand rotation
49	70411-503	1	Dump Valve sub-assembly
+ 49-1	16078-6	1	Retaining Ring
49-2	70411-501	1	Separator Plug
49-3	70411-502	1	Separator
+ 49-4	16003-7	1	O-ring, 1.59 mm Dia. x 9.53 mm I.D. [.0625 in. Dia. x .375 in. I.D.]
+ 49-5	16133-10	1	O-ring, 2.46 mm Dia. x 19.18 mm I.D. [.097 in. Dia. x .755 in. I.D.]
49	16169-1140	1	Plug Assembly
49-5	16133-10	1	O-ring, 2.46 mm Dia. x 19.18 mm I.D. [.097 in. Dia. x .755 in. I.D.]
50	16103-306	1	Plug Assembly
+ 50-1	16133-6	1	O-ring, 1.98 mm Dia. x 11.89 mm ID. [.078 in. Dia. x .468 in. ID.]
51	16103-306	1	Plug Assembly
+ 51-1	16133-6	1	O-ring, 1.98 mm Dia. x 11.89 mm ID. [.078 in. Dia. x .468 in. ID.]

Mounting Kits

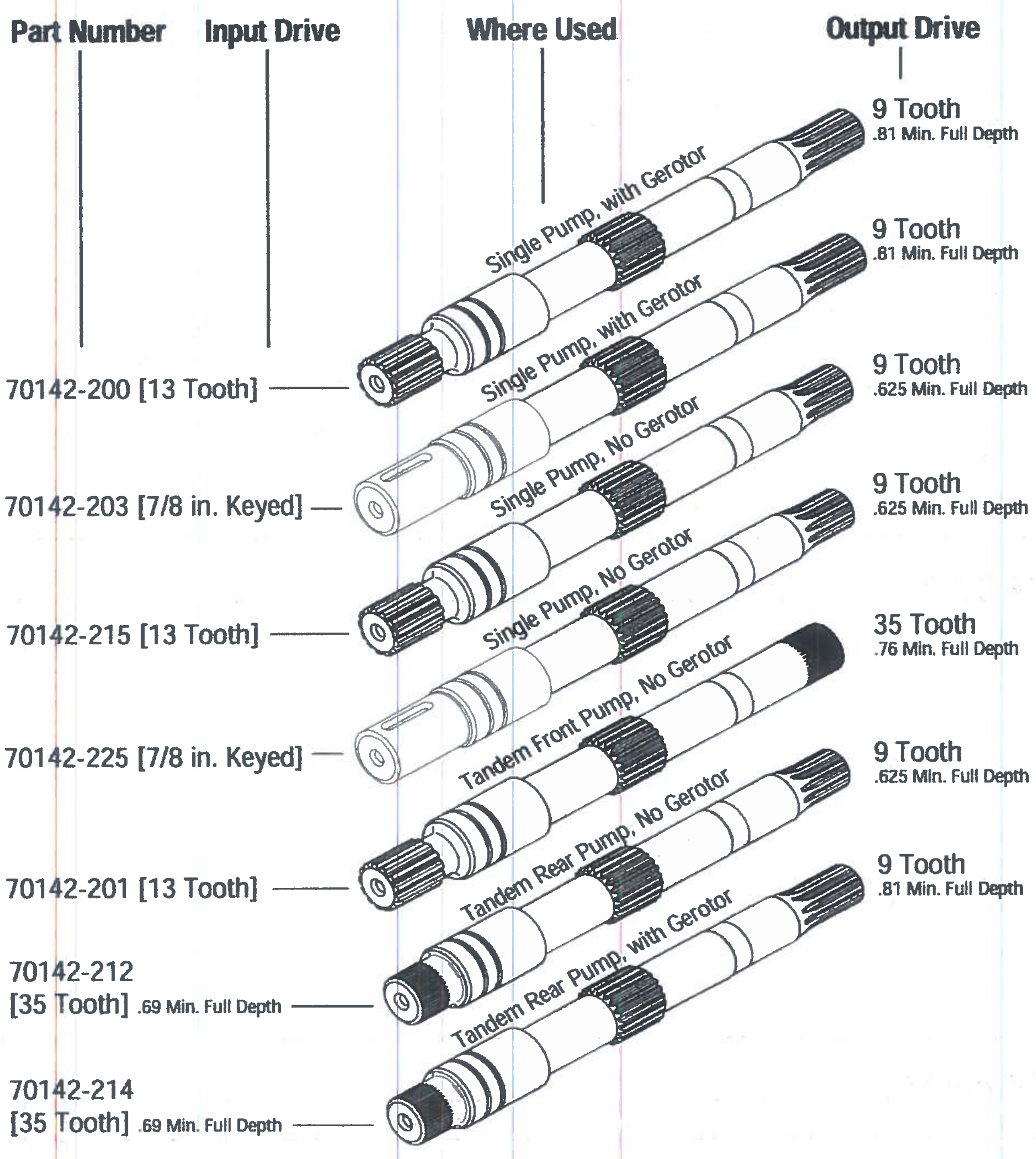
K1	70142-944	1	Tandem Piston Pump Mounting Kit
K1-1	70111-666	1	35T Coupler, 36.8 mm [1.45 in.] long
K1-2	16007-14	1	O-ring, 1.59 mm Dia. x 101.6 mm ID. [.0625 in. Dia. x 4 in. ID.]
K1-3	16032-613	2	Cap Screws
K1-4	16048-8	2	Washer
K2	70442-929	1	Gear Pump Mounting Kit
K2-1	16007-14	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K2-2	16048-113	2	Washer
K2-3	16032-612	2	Cap Screws
K3	70142-915	1	Cover Plate Kit
K3-1	16007-14	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K3-2	70142-600	1	Cover Plate
K3-3	16032-610	2	Cap Screws
K4	70144-903	1	Gear Pump Mounting Kit with Coupler
K4-1	16007-14	1	O-ring, 1.59 mm Dia. x 101.6 mm ID. [.0625 in. Dia. x 4 in. ID.]
K4-2	16048-113	2	Washer
K4-3	16032-612	2	Cap Screws
K4-4	70111-667	1	9T Coupler

Seal Repair Kit

•	70142-938	1	Seal Repair Kit for 70142, 70144 and 70145 piston pump.

Legend		
	™	Refer to specific item parts list.
	+	Included in seal repair kit.

Item 1 - Drive Shaft Identification

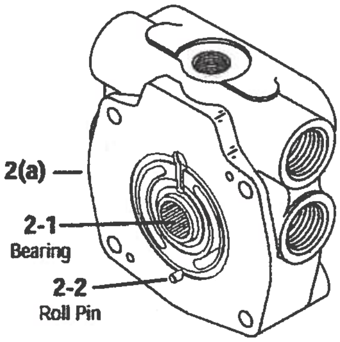


Item 2 -

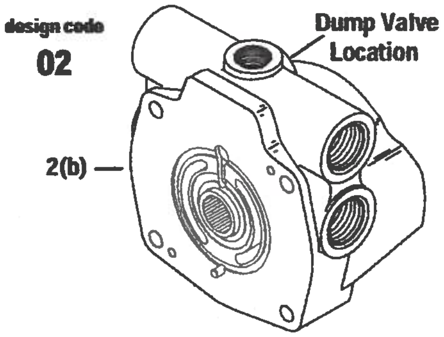
Backplate Assembly Identification

Item 2 - Parts List (Refer to Identification chart and drawings)

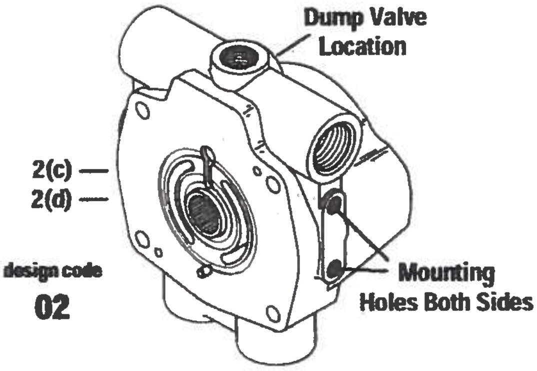
Item	Part No.	Qty.	Description
2	See chart below		Backplate Assembly
2-1	70420-43	1	Bearing
2-2	16026-610	1	Roll Pin



2(a)
Accepts
Gerotor Charge
Pump



2(b)
Rear "A" Mount,
Opposite
Side Porting



2(c)
Rear "A" Mount,
Same Side
Porting without
Mounting Holes

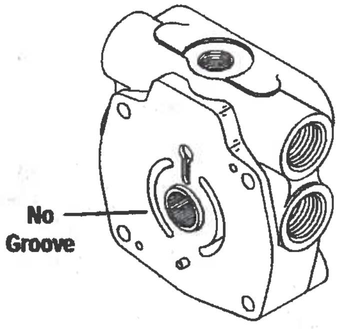
2(d)
Rear "A" Mount,
Same Side
Porting with
Mounting Holes

Item 2 - design code 02 numbers

Backplate Assembly Identification (Refer to drawings above)

Description	Assembly Part Number	Additional Description
2(a) - Accepts Gerotor Charge Pump	70119-001	
2(b) - Rear "A" Mount, Opposite Side Porting	70117-003....... 70117-004.......	Dump Valve Port Machined in Bkpt./Assy. No Dump Valve Port Machined in Bkpt./Assy.
2(c) - Rear "A" Mount, Same Side Porting without Mounting Holes	70121-003....... 70121-006.......	No Dump Valve Port Machined in Bkpt./Assy. Dump Valve Port Machined in Bkpt./Assy.
2(d) - Rear "A" Mount, Same Side Porting with Mounting Holes	70121-011....... 70121-014.......	No Dump Valve Port Machined in Bkpt./Assy. Dump Valve Port Machined in Bkpt./Assy.

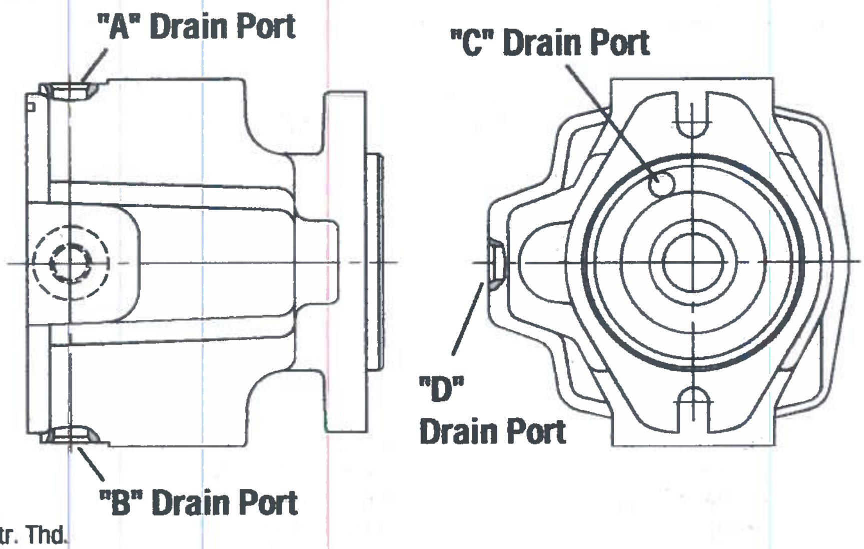
design code
01
Identification



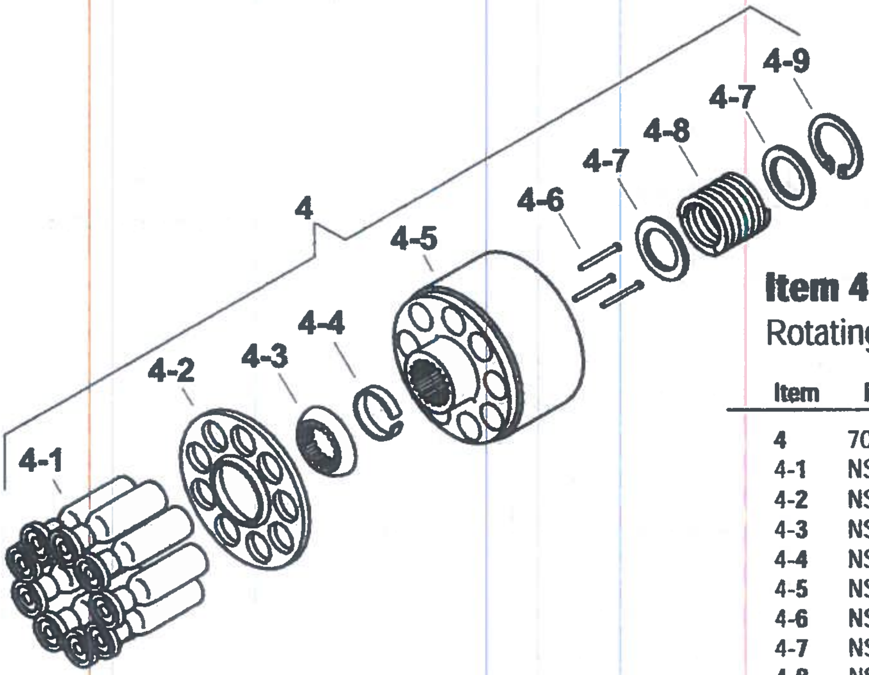
Item 3 - Housing Identification
Item 4 - Rotating Kit Assembly

Item 3
Housing Identification

Item	Part No.	Port Machined
3	70115-001	A
	70115-002	B
	70115-003	C
	70115-004	A, B
	70115-005	A, C
	70115-006	B, C
	70115-007	None
	70115-008	A, B, C
	70115-009	D



Drain Port Sizes:
Drain Port A, B, and D are 9/16-18 SAE Str. Thd.
Thru Drain Port C is 9.55[.376] dia.



Item 4
Rotating Kit Assembly

Item	Part No.	Qty.	Description
4	70111-692	1	Rotating Kit Assy.
4-1	NSS	9	Piston Assembly
4-2	NSS	1	Spider
4-3	NSS	1	Spider Pivot
4-4	NSS	1	Retainer
4-5	NSS	1	Piston Block
4-6	NSS	3	Pins
4-7	NSS	2	Washer
4-8	NSS	1	Spring
4-9	NSS	1	Retaining Ring

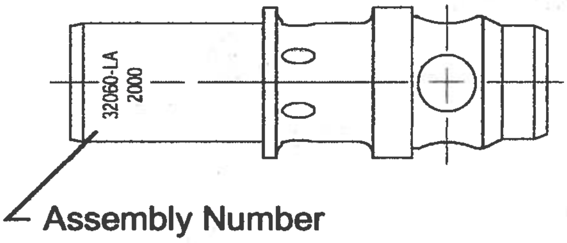
NSS - Not Sold Separately

Item 20 or 21 - Relief Valve
Item 48 - Valve Plate

Item 20 or 21

Internal Relief Valve Settings Available

Part Number	bar [lbf/in²]
32060-**LA**	138 [2000]
32060-**QA**	172 [2500]
32060-**UA**	207 [3000]
32060-**WA**	241 [3500]
32060-**ZA**	276 [4000]
32060-**XA**	310 [4500]
32060-**IA**	345 [5000]
70111-518	Seat, Valve

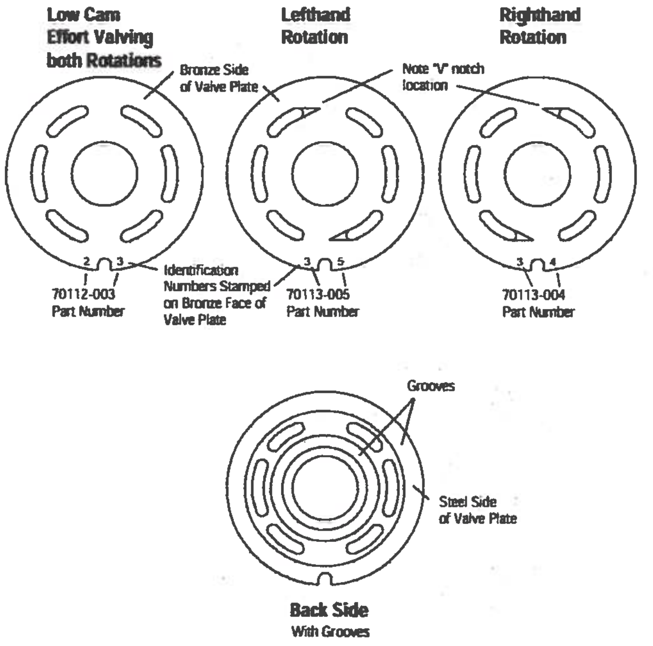


Assembly Number and Pressure Setting

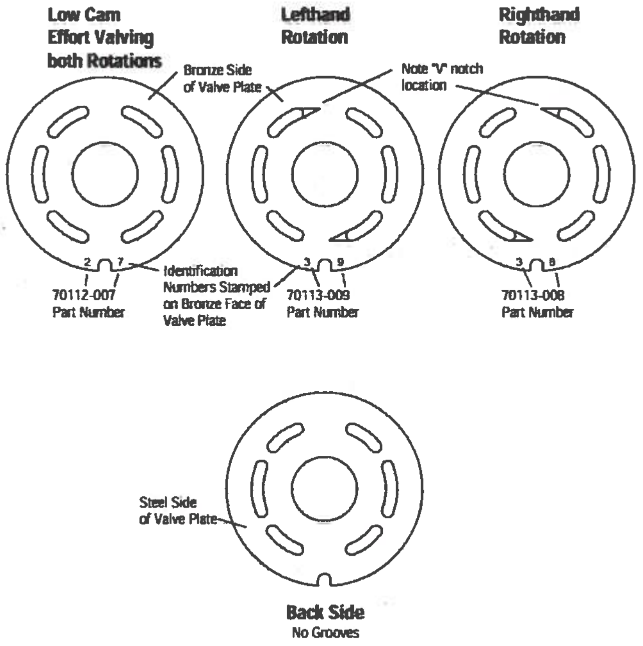
Item 48

Valve Plate Identification

Design Code 01



Design Code 02

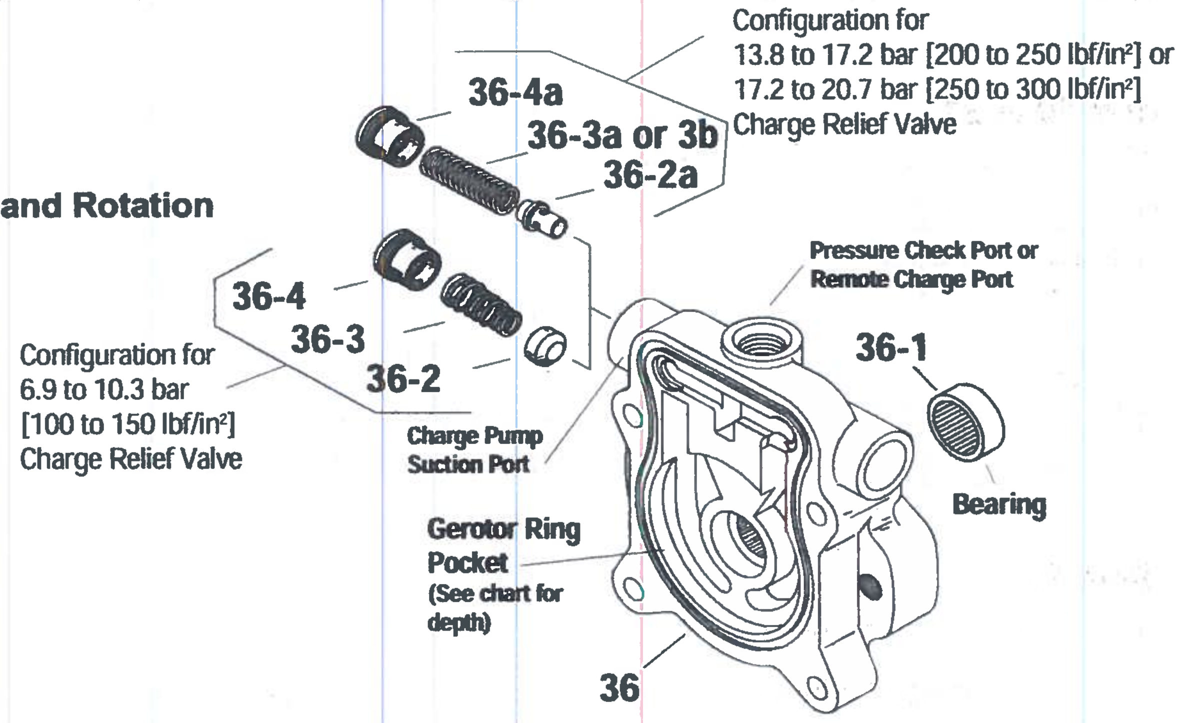

Low Cam Effort Valving both Rotations
Lefthand Rotation
Righthand Rotation
Bronze Side of Valve Plate
Note "V" notch location
2
7
Identification Numbers Stamped on Bronze Face of Valve Plate
70112-007 Part Number
3
9
70113-009 Part Number
3
8
70113-008 Part Number
Steel Side of Valve Plate
Back Side
No Grooves

Note: The design code 01 valve plate must be used with the design code 01 backplates without grooves. The design code 01 valve plate may also be used with design code 02 backplate (See page 7 for backplate identification).

Item 36 -

Charge Pump Adapter Assembly Identification

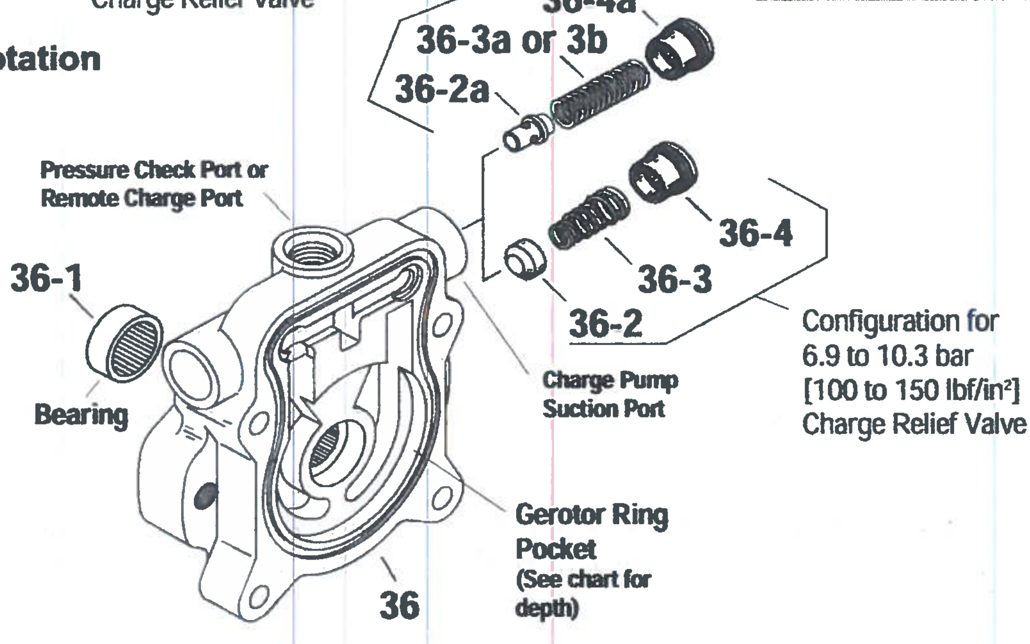
Righthand Rotation



Gerotor Pocket Depth

Displacement cm^3/r [in^3/r]	Depth of Pocket mm [in.]
6.9 [.42]	6.35 [.25]
13.8 [.84]	12.7 [.50]

Lefthand Rotation



Item 36 -

Charge Pump Adapter Assembly

6.9 to 10.3 bar [100 to 150 lbf/in^2] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
36	70142-314	1	Assembly, Charge Pump Adapter	Righthand	6.88 cm^3/r [.42 in^3/r]
	70142-306	1	Assembly, Charge Pump Adapter	Lefthand	13.8 cm^3/r [.84 in^3/r]
	70141-397	1	Assembly, Charge Pump Adapter	Righthand	13.8 cm^3/r [.84 in^3/r]
	70142-359	1	Assembly, Charge Pump Adapter	Lefthand	6.88 cm^3/r [.42 in^3/r]
36-1	16239-1148	1	Bearing (press fit)		
36-2	70111-507	1	Poppet, Cup		
36-3	17000-48B	1	Spring, Tapered		
36-4	70400-505	1	Spring Retainer		

13.8 to 17.2 bar [200 to 250 lbf/in^2] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
36	70142-373	1	Assembly, Charge Pump Adapter	Lefthand	6.88 cm^3/r [.42 in^3/r]
	70142-377	1	Assembly, Charge Pump Adapter	Righthand	6.88 cm^3/r [.42 in^3/r]
	70142-380	1	Assembly, Charge Pump Adapter	Righthand	13.8 cm^3/r [.84 in^3/r]
	70142-385	1	Assembly, Charge Pump Adapter	Lefthand	13.8 cm^3/r [.84 in^3/r]
36-1	16239-1148	1	Bearing (press fit)		
36-2a	70400-685	1	Poppet, Pin		
36-3a	17056-40	1	Spring, Color "Light Green"		
36-4a	70400-512	1	Spring Retainer		

17.2 to 20.7 bar [250 to 300 lbf/in^2] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
36	70142-376	1	Assembly, Charge Pump Adapter	Righthand	6.88 cm^3/r [.42 in^3/r]
	70142-381	1	Assembly, Charge Pump Adapter	Lefthand	6.88 cm^3/r [.42 in^3/r]
	70142-386	1	Assembly, Charge Pump Adapter	Lefthand	13.8 cm^3/r [.84 in^3/r]
36-1	16239-1148	1	Bearing (press fit)		
36-2a	70400-685	1	Poppet, Pin		
36-3b	17056-41	1	Spring, Color "Pink"		
36-4a	70400-512	1	Spring Retainer		

Each order must include the following information.

1. Product and/or Part Number
2. Serial Number Code
3. Part Name
4. Quantity

Identification Numbers - Variable Displacement Piston Pump

Number is stamped on each units mounting flange.

A - Product Number Description
- 70142 = Piston Pump (20.3 cm³/r [1.24 in³/r]) with Gerotor
- 70144 = Piston Pump (20.3 cm³/r [1.24 in³/r]) without Gerotor
- 70145 = Piston Pump (23.6 cm³/r [1.44 in³/r]) with or without Gerotor
- 78113 = Tandem Piston Pumps (20.3 cm³/r [1.24 in³/r]) no Gear Pump
- 78114 = Tandem Piston Pumps (20.3 cm³/r [1.24 in³/r]) with Gear Pump
- 78115 = Tandem Piston Pumps (23.6 cm³/r [1.44 in³/r]) no Gear Pump
- 78116 = Tandem Piston Pumps (23.6 cm³/r [1.44 in³/r]) with Gear Pump

B - Rotation
- L = Lefthand
- R = Righthand

C - Sequential Lettering

D - Design Code Number
- 01 - valve plate design
- 02 - Change in valve plate & backplate.

Single Pump - Product Number:

70142 - R A A - 0 2

A (70142), B (R), C (A), D (02)

Tandem Pumps - Product Number:

78113 - R A B - 0 2

A (78113), B (R), C (B), D (02)

Serial Number Code:

B 93 01 31 JB

B — Revision level of parts list.
93 — Last two digits of year built. (93 for 1993 etc.)
01 — Month (two digits)
31 — Day of Month (two digits)
JB — Testers Initials

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Form No. 6-632

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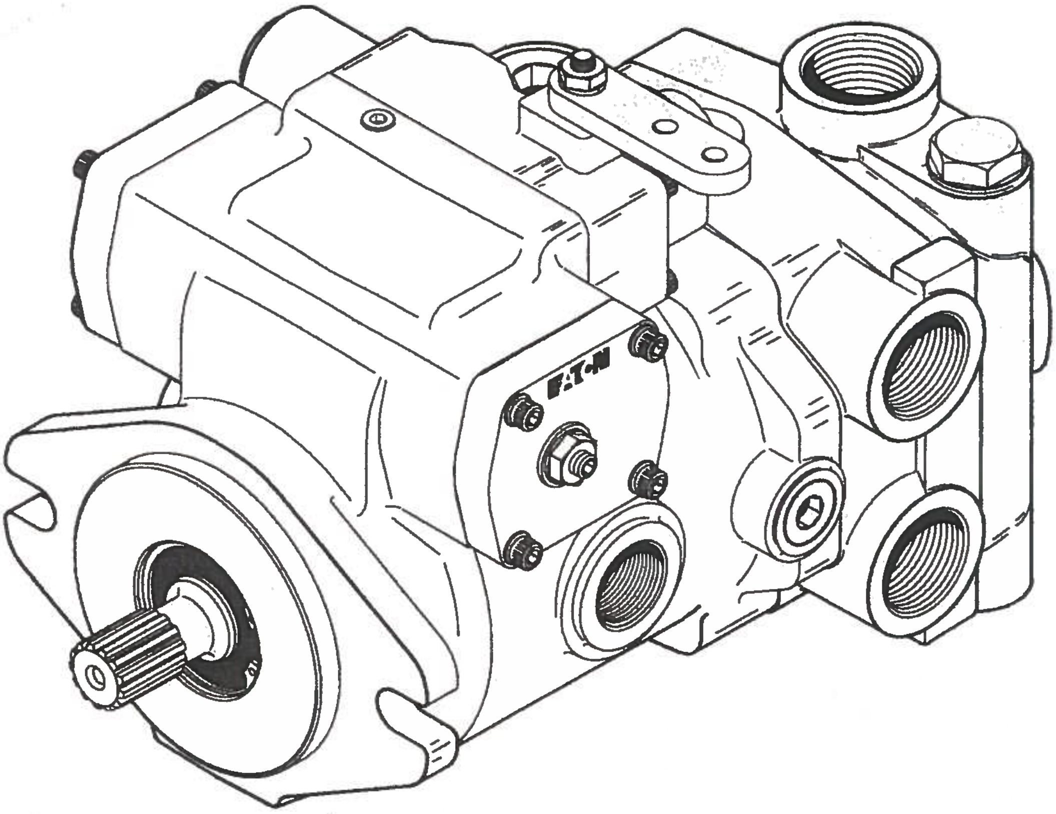
EATON

Eaton®
Medium Duty Piston Pump

No. 6-633
December, 1995

Parts Information

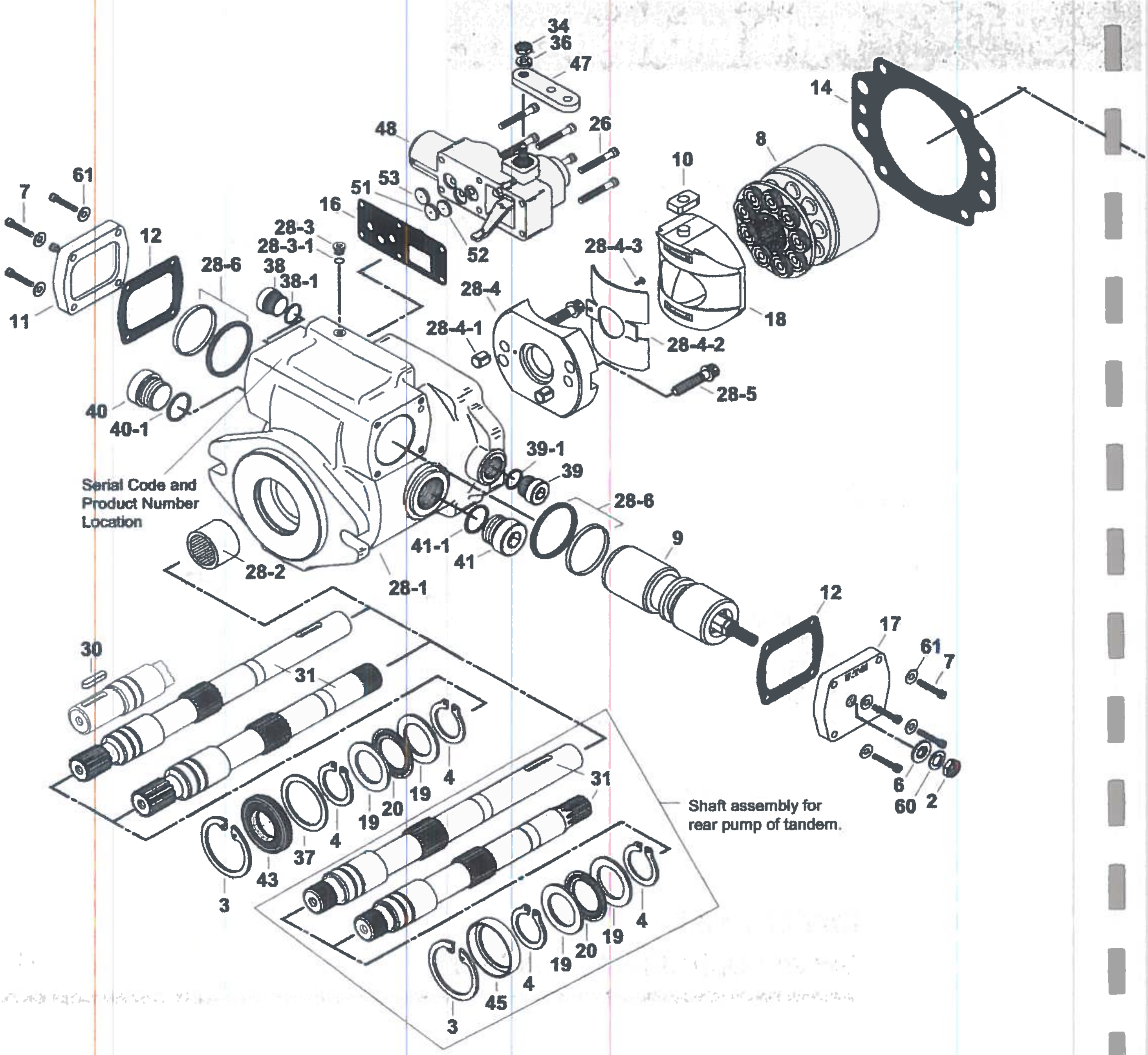


Model 72400
Servo Controlled Piston Pump

03

Parts Drawing

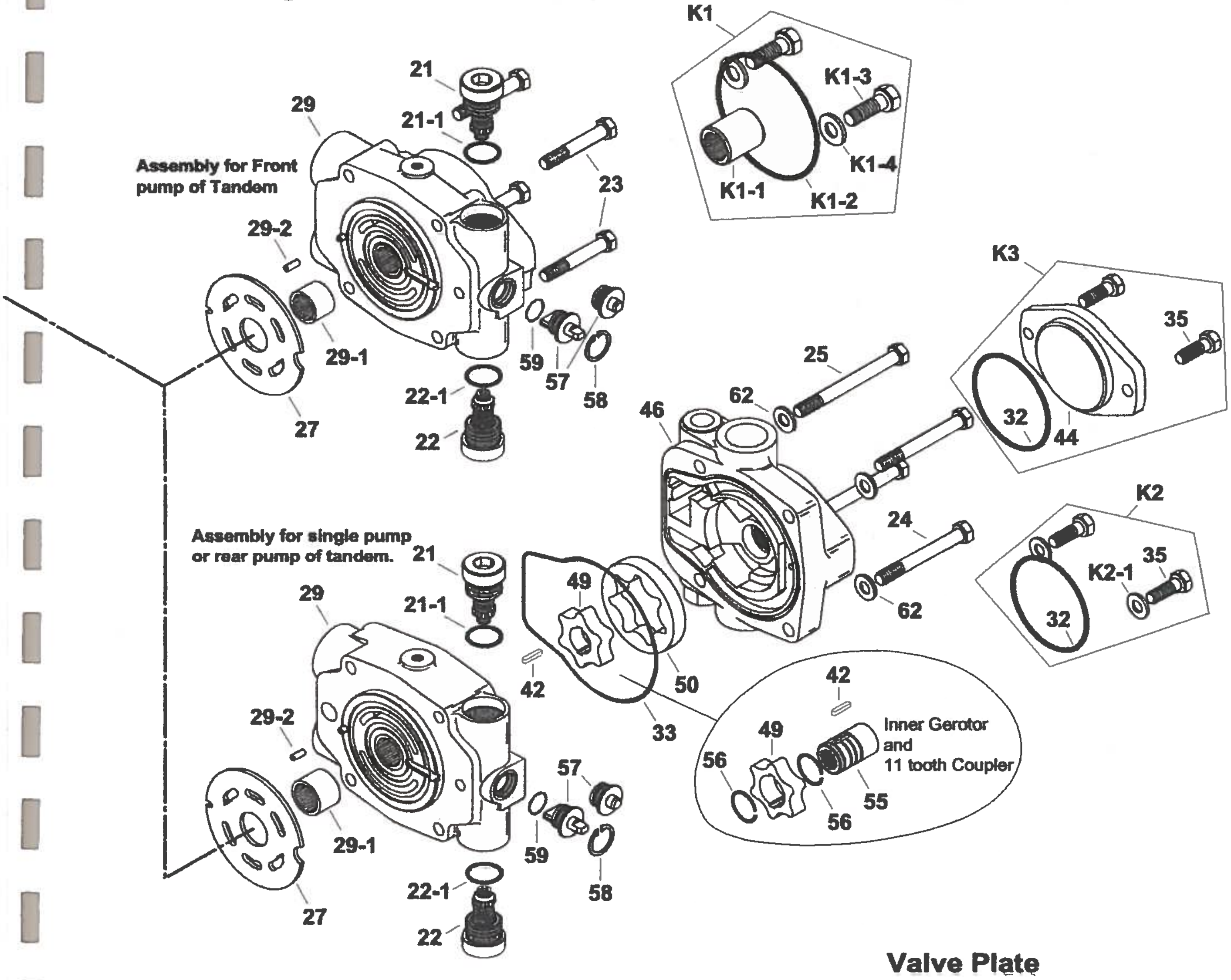
Pump drawn below is typical of a righthand rotation with porting out the left side of pump.



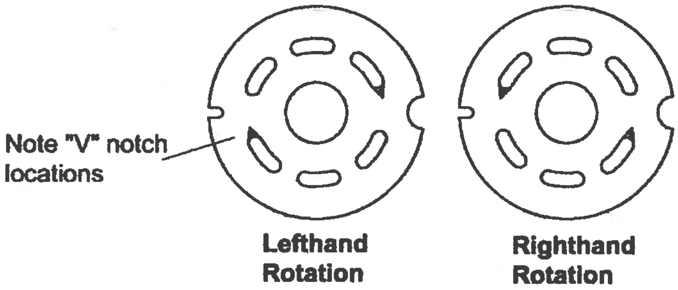
Serial Code and Product Number Location

Shaft assembly for rear pump of tandem.

Parts Drawing



Valve Plate Identification



Parts List

	Item	Part No.	Qty.	Description
	2	16024-6	1	Jam Nut
+	3	16077-32	1	Retaining Ring
+	4	16078-18	2	Retaining Ring
+	6	16254-6	1	Seal Washer
	7	16147-310	8	Cap Screw, #10-24, 25.4 mm [1.0 in.] Long
	8	70300-603	1	Rotating Kit Assembly, 2.48 in^3/r (parts list on page 6)
	9	72400-576	1	Servo Piston Assembly (parts list on page 6)
	10	72400-585	1	Servo Piston Follower
	11	72400-620	1	Cover Plate
+	12	72400-621	2	Cover Plate Gasket
+	14	72400-626	1	Housing Gasket
+	16	72400-631	1	Control Housing Gasket
	17	72400-651	1	Cover Plate
	18	72400-677	1	Camplate
	19	74308-100	2	Thrust Race
	20	74308-101	1	Thrust Bearing
	21	◆	1	Relief Valve for Port "C" (parts list on page 7)
+	21-1	16133-12	1	O-ring, 2.95 mm Dia. x 23.47 mm I.D. [.116 in. Dia. x .924 in. I.D.]
	22	◆	1	Relief Valve for Port "D" (parts list on page 7)
+	22-1	16133-12	1	O-ring, 2.95 mm Dia. x 23.47 mm I.D. [.116 in. Dia. x .924 in. I.D.]
	23	16136-622	4	Cap Screw, 3/8-16, 57.2 mm [2.25 in.] Long
	24	16136-634	2	Cap Screw, 3/8-16, 88.9 mm [3.5 in.] Long
	25	16136-640	2	Cap Screw, 3/8-16, 101.6 mm [4.0 in.] Long
	26	16147-314	6	Cap Screw
	27		1	Valve Plate, 2.48 in^3/r
		70344-51		Righthand (CW) Rotation
		70344-52		Lefthand (CCW) Rotation
	28	◆	1	Housing Assembly (Identification on page 7)
	28-1	◆	1	Housing (Identification on page 7)
	28-2	16238-11816	1	Bearing (press fit)
	28-3	025083-002	1	Plug Sub-Assembly
+	28-3-1	008785-002	1	O-ring, 1.63 mm Dia. x 6.1 mm I.D. [.064 in. Dia. x .239 in. I.D.]
	28-4	72400-669	1	Cradle Sub-Assembly
	28-4-1	72400-670	2	Dowel Bushing
	28-4-2	72400-684	1	Bushing
	28-4-3	16269-106	1	Cap Screw, Button Head
	28-5	16312-514	2	Cap Screw
+	28-6	72400-583	2	Seal Sub-Assembly
	29	◆	1	Backplate Assembly (Identification on page 8 & 9)
	29-1	52200-23	1	Bearing (press fit)
	29-2	16026-610	1	Roll Pin
	30	16246-516	1	Key
	31	◆	1	Drive Shaft (Identification on page 15)
		72400-200		15 tooth, 16/32 DP - w/ 41 tooth, 48/96 DP (Tandem Front Pump)
		72400-201		41 tooth, 48/96 DP - w/ 11 tooth, 16/32 DP (Tandem Rear Pump)
		72400-202		41 tooth, 48/96 DP - w/ 9 tooth, 16/32 DP (Tandem Rear Pump)
		72400-204		15 tooth, 16/32 DP - w/ 9 tooth, 16/32 DP (Single Pump)
		72400-211		13 tooth, 16/32 DP - w/ 9 tooth, 16/32 DP (Single Pump)
		72400-212		15 tooth, 16/32 DP - w/ 11 tooth, 16/32 DP (Single Pump)
		72400-213		25.4 [1.00] Dia. Str., w/ keyway - w/ 9 tooth,16/32 DP (Single Pump)
+	32	16007-14	1	O-ring,1.59 mm Dia. x 82.55 mm I.D. [.0625 in. Dia. x 3.25 in. I.D.]
+	33	72400-646	1	Molded O-ring
	34	16021-4	1	Nut
	35	16032-610	2	Cap Screw, 3/8-16, 25.4 mm [1.0 in.] Long
	36	16045-104	1	Lockwasher
	37	16048-319	1	Washer
	38	16103-308	1	Plug
+	38-1	16133-8	1	O-ring, 2.21 mm Dia. x 16.36 mm I.D. [.087 in. Dia. x .644 in. I.D.]

Parts List

Item	Part No.	Qty.	Description
39	16103-308	1	Plug
+ 39-1	16133-8	1	O-ring, 2.21 mm Dia. x 16.36 mm I.D. [.087 in. Dia. x .644 in. I.D.]
40	16103-312	1	Plug
+ 40-1	16133-12	1	O-ring, 2.95 mm Dia. x 23.47 mm I.D. [.116 in. Dia. x .924 in. I.D.]
41	16103-312	1	Plug
+ 41-1	16133-12	1	O-ring, 2.95 mm Dia. x 23.47 mm I.D. [.116 in. Dia. x .924 in. I.D.]
42		1	Key
	16246-429		Used with 9 tooth internal spline through shafts
	16246-431		Used on 11 tooth drive coupler with 12.7 mm [.5 in.] width gerotor
	16244-443		Used on 11 tooth drive coupler with 6.35 mm [.25 in.] width gerotor
+ 43	16253-18	1	Shaft Seal
44	70142-600	1	Cover Plate
45	70400-620	1	Spacer
46	◆	1	Charge Pump Adapter Assembly (parts list & ID. on Page 10 &11)
47	72400-506	1	Control Arm
48	◆	1	Servo Control Assembly (parts list & ID. on Page 12 &13)
49		1	Inner Ring Gerotor (match displacement with Item 46 & 50)
	79004-611		6.9 mL/r [.42 cu. in./r] displacement, 6.35 mm [.25 in.] width
	79004-605		13.8 mL/r [.84 cu. in./r] displacement, 12.7 mm [.5 in.] width
	72400-640		13.8 mL/r [.84 cu. in./r] displacement (used with Item 55 coupler)
50		1	Outer Ring Gerotor (match displacement with Item 46 & 49)
	79004-612		6.9 mL/r [.42 cu. in./r] displacement, 6.35 mm [.25 in.] width
	79004-606		13.8 mL/r [.84 cu. in./r] displacement, 12.7 mm [.5 in.] width
51	◆	1	Supply Orifice (orifice chart on page 14)
52	◆	1	Control Valve Orifice (orifice chart on page 14)
53	◆	1	Control Valve Orifice (orifice chart on page 14)
55	72400-639	1	Coupler, 11 tooth
56	72400-638	2	Retaining Ring, (used with Item 55)
57		1	Dump Valve
	72400-515		Dump Valve Actuator
	72400-518		Plug (selected when dump valve is not required)
+ 58	16077-16	1	Retaining Ring
+ 59	16256-4	1	Quad-ring, 1.59 mm Dia. x 15.9 mm I.D. [.0625 in. Dia. x .625 in. I.D.]
60	16254-26	1	Washer
61	16048-672	8	Washer
62	106013-038	4	Washer

Kits

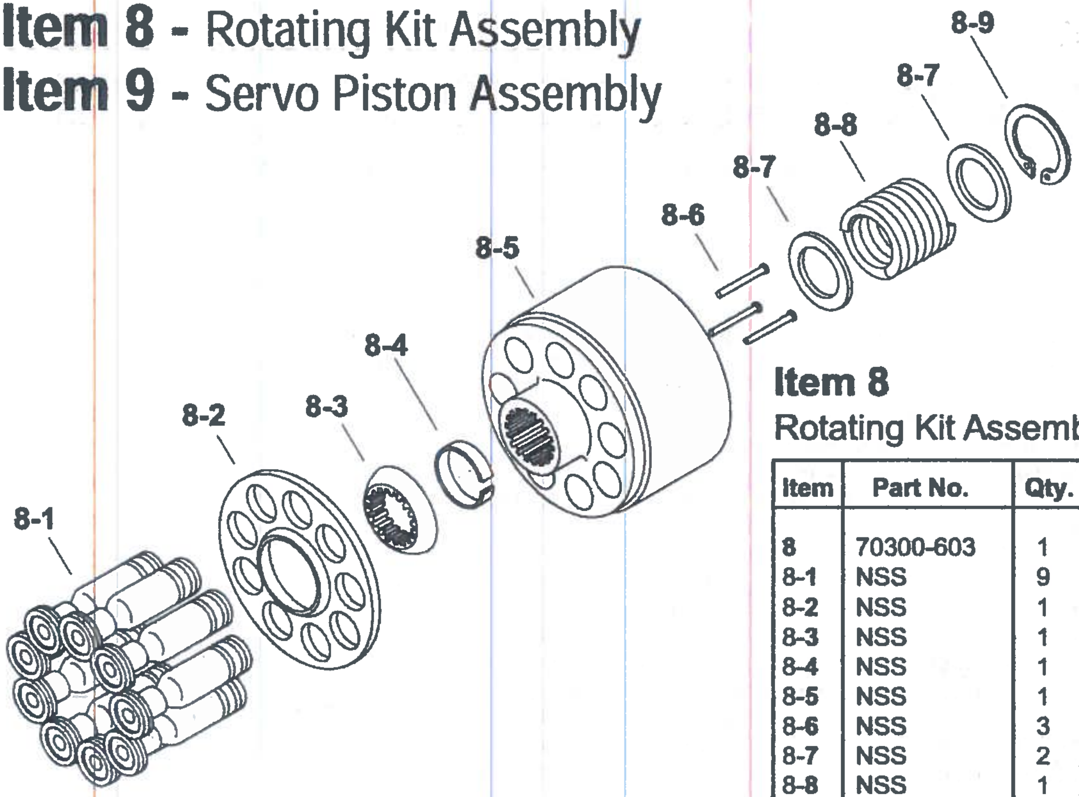
K1	72400-902	1	Tandem Servo Piston Pump Mounting Kit
K1-1	70411-622	1	Coupler, 41 tooth
+ K1-2	16007-17	1	O-ring, 1.59 mm Dia. x 101.6 mm I.D. [.0625 in. Dia. x 4 in. I.D.]
K1-3	16032-812	2	Cap Screw, 3/8-16, 25.4 mm [1.0 in.] Long
K1-4	16048-72	2	Washer
K2	70442-929	1	Gear Pump Mounting Kit Includes Items 32 and 35
K2-1	16048-113	2	Washer
K3	70142-915	1	Cover Plate Kit for "A" SAE Flange Series 82-2 Mount Includes Items 32, 35, and 44
	72400-908	1	Seal Repair Kit for single pumps (Two Required for Tandem Units)
	72400-900	1	Dump valve kit,Includes Items 57 (Actuator), 58, & 59
	72400-901	1	Dump valve plug kit, Includes Items 57 (Plug), 58, & 59

Legend

◆ Refer to specific Item parts list.

+ Parts included in 72400-908 Seal Repair kit.

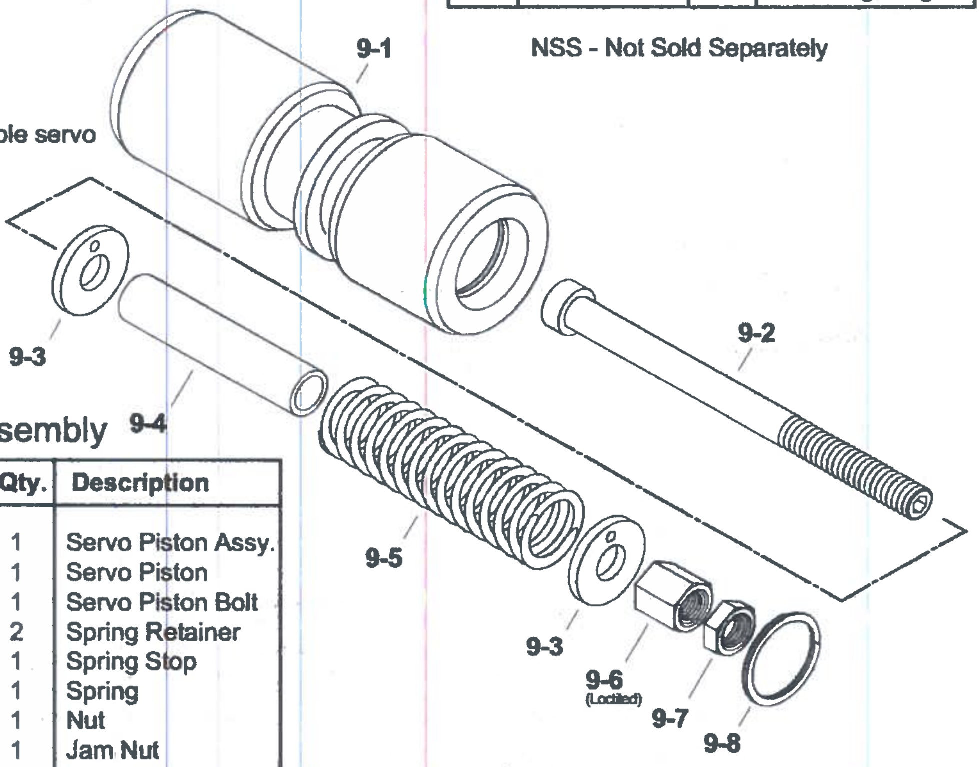
Item 8 - Rotating Kit Assembly
Item 9 - Servo Piston Assembly



Item 8
Rotating Kit Assembly

Item	Part No.	Qty.	Description
8	70300-603	1	Rotating Kit Assy.
8-1	NSS	9	Piston Assembly
8-2	NSS	1	Spider
8-3	NSS	1	Spider Pivot
8-4	NSS	1	Retainer
8-5	NSS	1	Piston Block
8-6	NSS	3	Pins
8-7	NSS	2	Washer
8-8	NSS	1	Spring
8-9	NSS	1	Retaining Ring

NSS - Not Sold Separately



Note: Do not disassemble servo piston assembly.

Item 9
Servo Piston Assembly

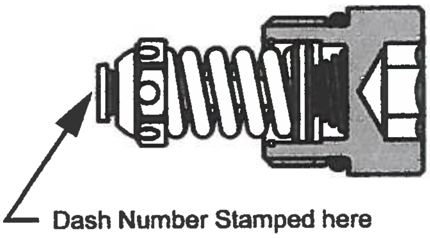
Item	Part No.	Qty.	Description
9	72400-576	1	Servo Piston Assy.
9-1	NSS	1	Servo Piston
9-2	NSS	1	Servo Piston Bolt
9-3	NSS	2	Spring Retainer
9-4	NSS	1	Spring Stop
9-5	NSS	1	Spring
9-6	NSS	1	Nut
9-7	NSS	1	Jam Nut
9-8	NSS	1	Retaining Ring

NSS - Not Sold Separately

Item 21 or 22 - Relief Valve
Item 28 - Housing Identification

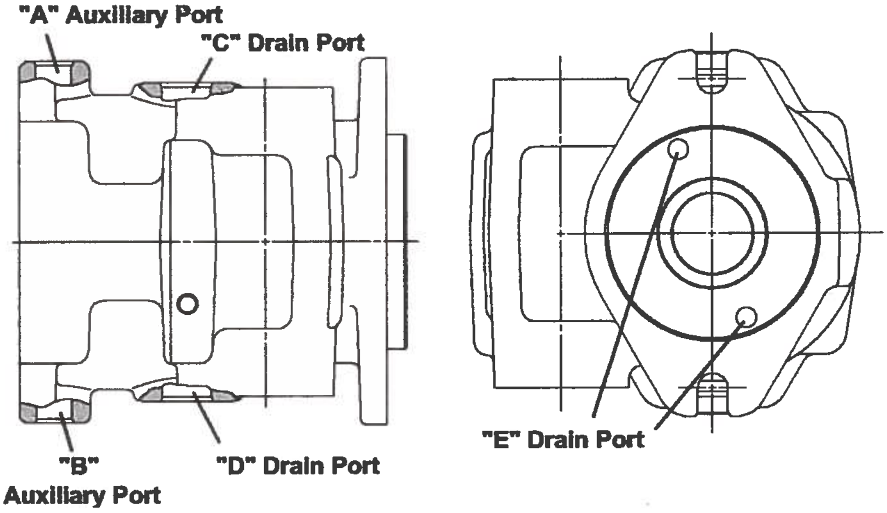
Item 21 or 22
Internal Relief Valve Settings Available

Part Number	bar [PSI]
106639-200	138 [2000]
106639-250	172 [2500]
106639-300	207 [3000]
106639-350	241 [3500]
106639-400	276 [4000]
106639-450	310 [4500]
106639-500	345 [5000]



Dash Number Stamped here
for Valve Pressure Setting Identification
Example: 500 x 10 = [5000 PSI] 345 bar

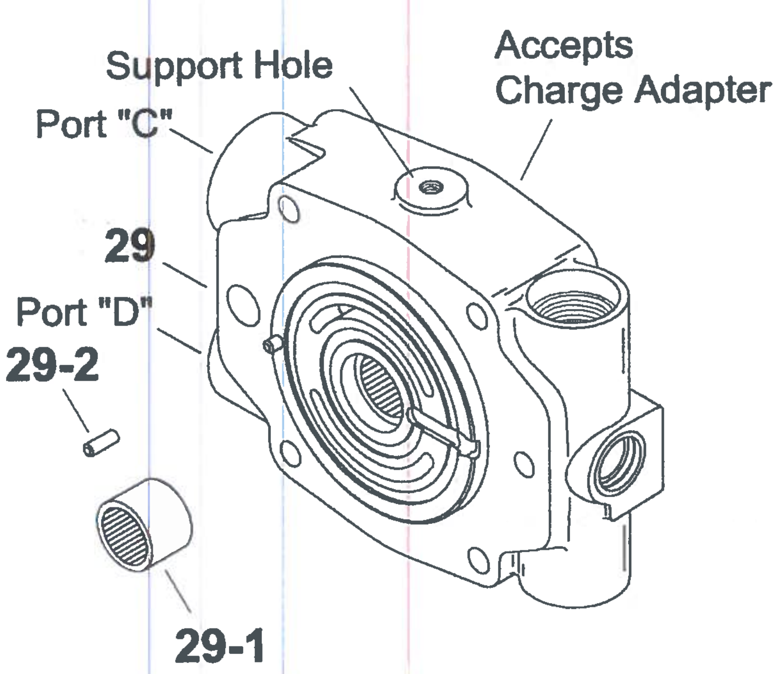
Item 28
Housing Identification

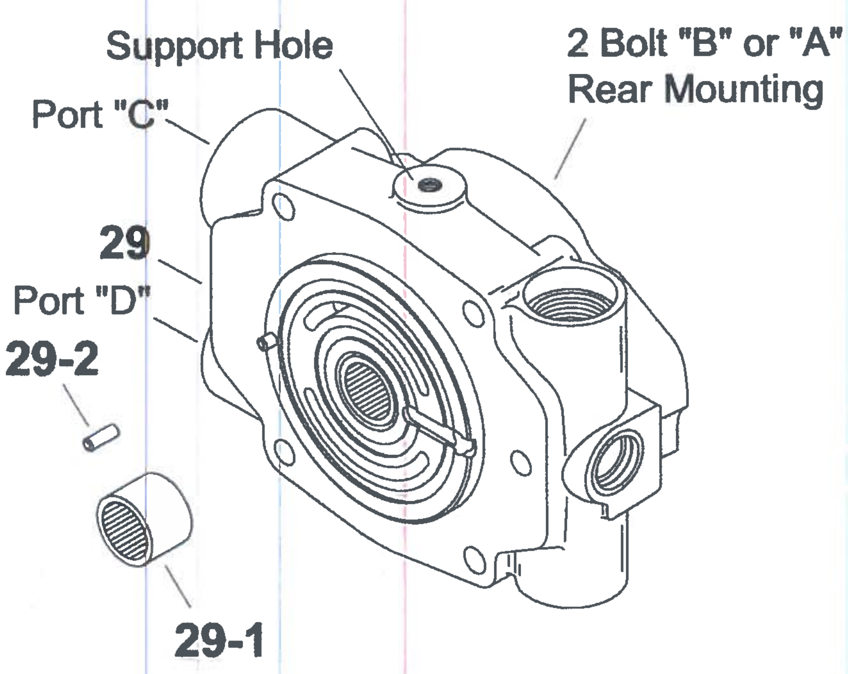


Housing Assy. Item	Part No.	Housing Item	Part No.	Qty.	Port Machined
28	72339-001	28-1	72338-001	1	A, B, C, D
28	72339-012	28-1	72338-012	1	A, B, C, D, E
28	72339-013	28-1	72338-013	1	A, B, E

Item 29 -

Backplate Assembly Identification





Item 29 - Parts List

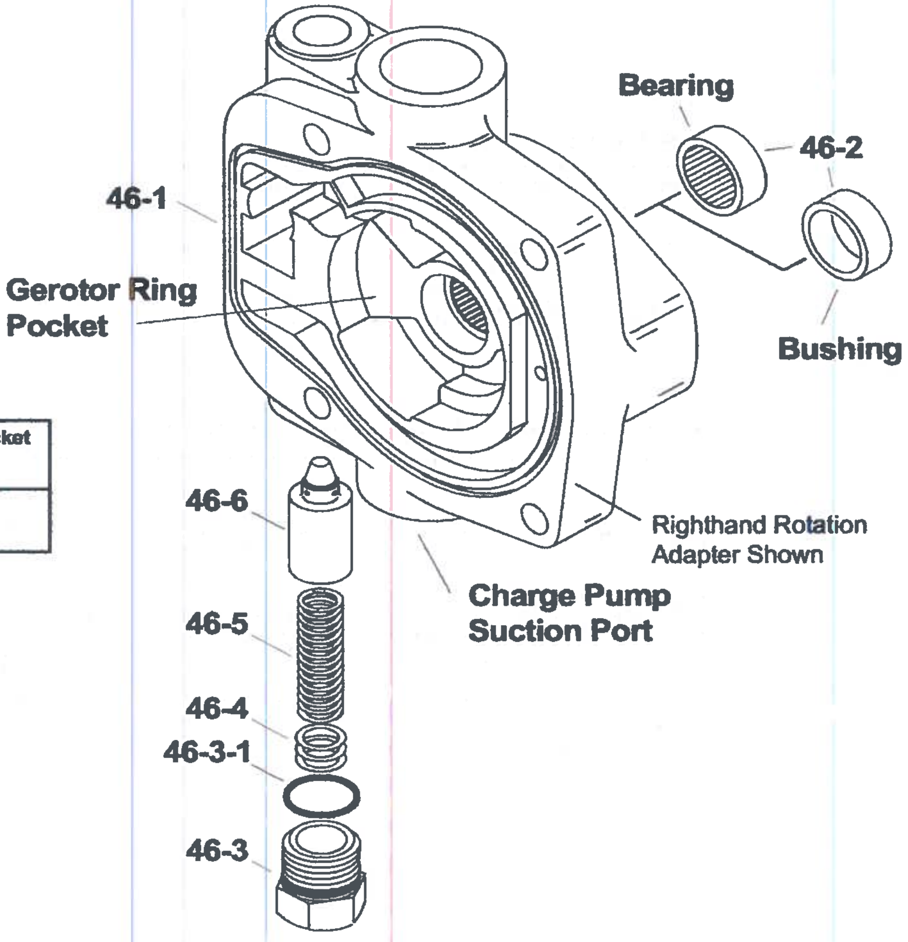
Parts List

Item	Part No.	Qty.	Description
29	Chart Below	1	Backplate Assembly
29-1	52200-23	1	Bearing (press fit)
29-2	16026-610	1	Roll Pin

Item 29 - Backplate Assembly Part Number Identification

Rear Mounting	**Support Hole**	**Item 29 Backplate Assembly Part Number**
Rear "B" Mount (no gerotor charge adapter)	with Hole	**72346-005**
	None	**72346-001**
Accepts Gerotor Charge Pump Adapter with "A" Mount	with Hole	**72342-005**
	None	**72342-001**
Rear "A" Mount (no gerotor charge adapter)	with Hole	**72344-005**
	None	**72344-001**

Item 46 -
Charge Pump Adapter Assembly



Gerotor Pocket Depth

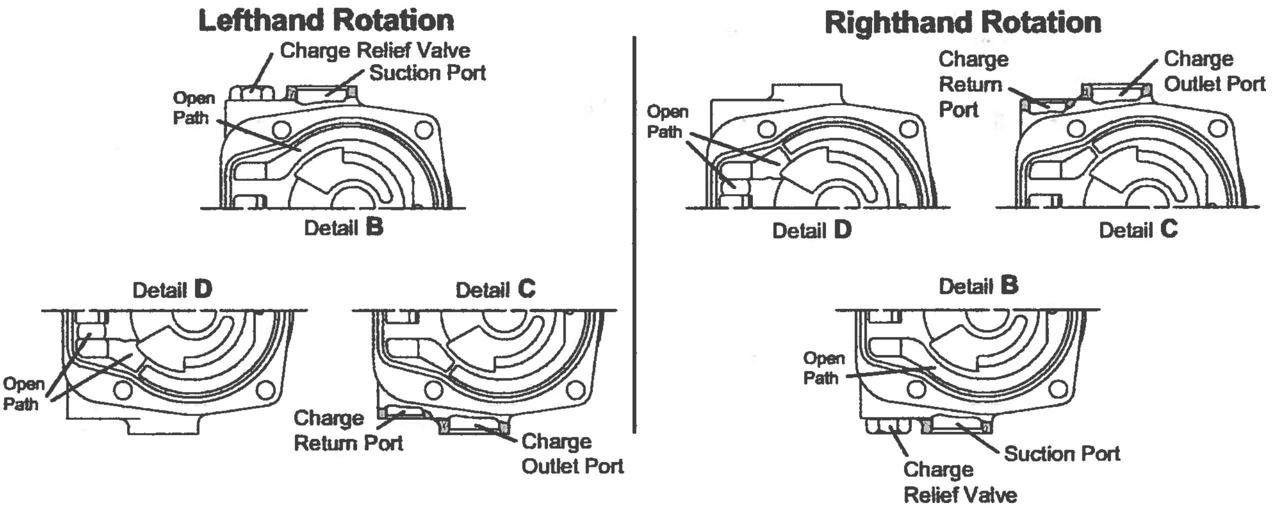
Displacement cm³/r [in³/r]	Depth of Pocket mm [in.]
6.9 [.42] 13.8 [.84]	6.35 [.25] 12.7 [.50]

	Item	Part No.	Qty.	Description
	46	See Chart	1	Assembly, Charge Pump Adapter
	46-1	NSS	1	Charge Pump Adapter
	46-2	16239-1148	1	Bearing (press fit), Used w/9 tooth output shaft
	46-2	72400-637	1	Bushing (press fit), Used w/11 tooth output shaft
	46-3	72400-659	1	Plug
+	46-3-1	16133-10	1	O-ring
	46-4	16048-597	*ƒ*	Shims
	46-5	17059-16	1	Spring
	46-6	72400-679	1	Poppet

ƒ - Shim as required
NSS - Not sold separately

Item 46 -

Charge Pump Adapter Identification

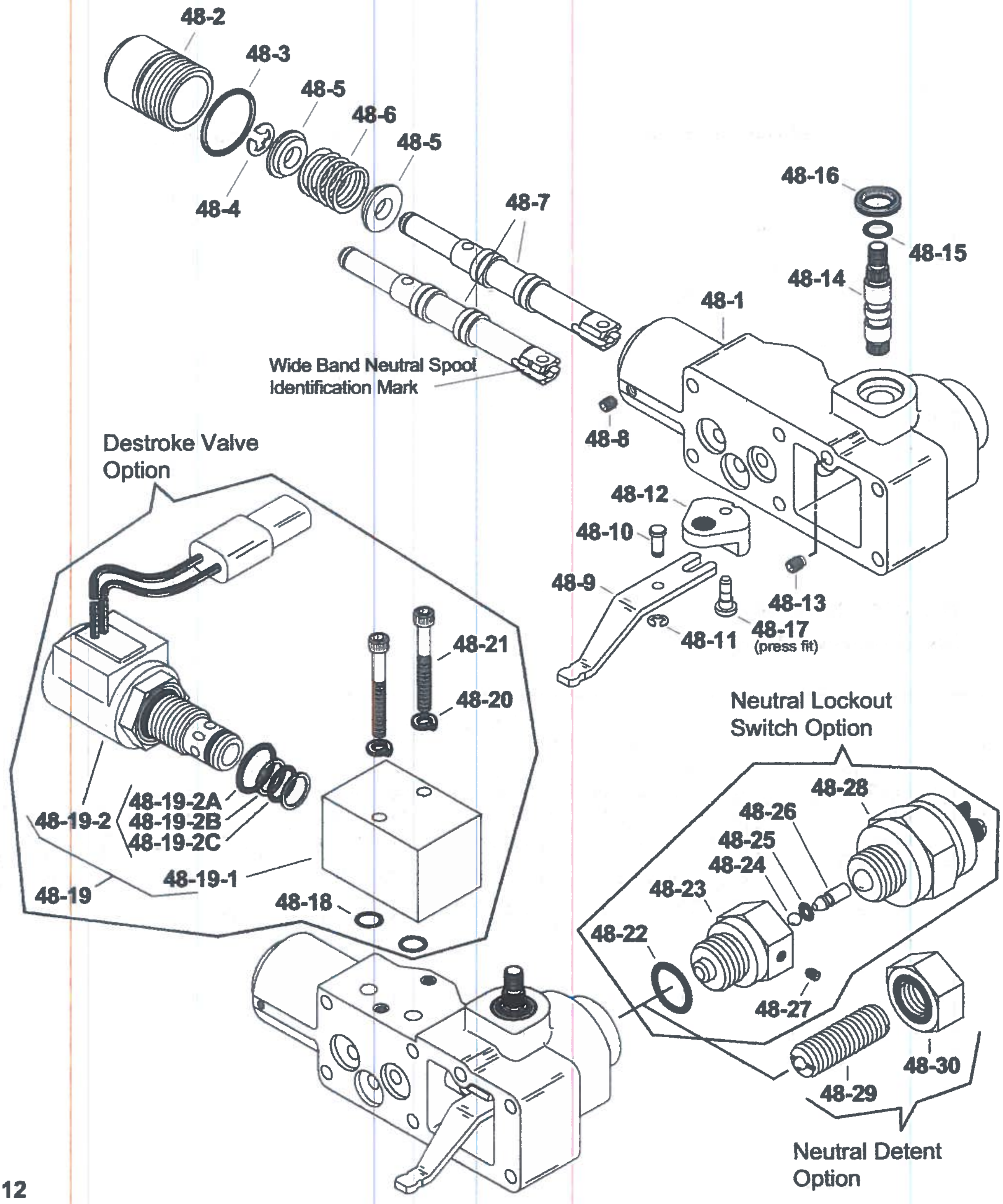


Adapter, Item 46, Identification Chart

			9 Tooth Output Shaft		11 Tooth Output Shaft	
Charge Pump Routing	**Shaft Rotation**	**Refer to Detail**	**6.9 cm^3/r [.42 in^3/r] Displacement**	**13.8 cm^3/r [.84 in^3/r] Displacement**	**6.9 cm^3/r [.42 in^3/r] Displacement**	**13.8 cm^3/r [.84 in^3/r] Displacement**
Charge Relieved to Case	Righthand	B & D	**72356-010**	**72356-011**	**72348-010**	**72348-011**
	Lefthand	B & D	**72358-010**	**72358-011**	**72360-010**	**72360-011**
Remote Filter and Charge Relieved to Case	Righthand	B & C	**72356-007**	**72356-008**	**72348-007**	**72348-008**
	Lefthand	B & C	**72358-007**	**72358-008**	**72360-007**	**72360-008**

Item 48 -

Manual Servo Control Assembly



Item 48 - Parts List

Item	Part No.	Qty	Description								
48	72401-AA		Assembly with no additional features								
48	72401-AB		Assembly with Neutral Lockout, Destroke valve & Wide Band Neutral								
48	72401-AC		Assembly with Neutral Lockout & Wide Band Neutral								
48	72401-AD		Assembly with Destroke Valve								
48	72401-AE		Assembly with Neutral Detent & Wide Band Neutral								
48	72401-AF		Assembly with Neutral Detent, Destroke valve & Wide Band Neutral								
48	72401-AG		Assembly with W/B Neutral Spool								
48	72401-AH		Assembly with W/B Neutral Spool & Destroke Valve								
48		1	**Manual Servo Control Assembly**	**-AA**	**-AB**	**-AC**	**-AD**	**-AE**	**-AF**	**-AG**	**-AH**
48-1		1	Control Housing								
	72319-001		Control Housing	X						X	
	72319-002		Control Housing			X					
	72319-003		Control Housing				X				X
	72319-004		Control Housing		X						
	72319-005		Control Housing					X			
	72319-006		Control Housing						X		
48-2	72400-507	1	Plug	X	X	X	X	X	X	X	X
+ 48-3	16015-8	1	O-ring	X	X	X	X	X	X	X	X
48-4	16124-31	1	Retaining Ring	X	X	X	X	X	X	X	X
48-5	72400-504	2	Spring Retainer	X	X	X	X	X	X	X	X
48-6	17073-14	1	Spool Centering Spring	X	X	X	X	X	X	X	X
48-7		1	Valve Spool								
	72400-501		Standard	X			X				
	72400-544		Wide Band Neutral		X	X		X	X	X	X
48-8	102149-019	1	Set Screw	X	X	X	X	X	X	X	X
48-9	72400-502	1	Feedback Link	X	X	X	X	X	X	X	X
48-10	72400-508	1	Dowel Pin	X	X	X	X	X	X	X	X
48-11	16124-15	1	Retaining Ring	X	X	X	X	X	X	X	X
48-12	72400-519	1	Bell Crank	X	X	X	X	X	X	X	X
48-13	16139-304	1	Set Screw	X	X	X	X	X	X	X	X
48-14	72400-505	1	Input Shaft	X	X	X	X	X	X	X	X
+ 48-15	16003-5	1	O-ring	X	X	X	X	X	X	X	X
+ 48-16	16074-106	1	Wiper Seal	X	X	X	X	X	X	X	X
48-17	72400-520	1	Headed Pin (press fit)	X	X	X	X	X	X	X	X
48-18	16003-6	2	O-ring		X		X		X		X
48-19	72420-AA	1	Destroke Valve Assy.		X		X		X		X
48-19-1	72400-522	1	Manifold		X		X		X		X
48-19-2		1	Destroke Valve								
	72400-521		w/12 VDC coil, Weatherpak Conn.		X		X		X		X
	72400-548		w/24 VDC coil, Weatherpak Conn.								
	72400-549		w/12 VDC coil, Din 43650 Conn.								
	72400-550		w/24 VDC coil, Din 43650 Conn.								
48-19-2A	16133-10	1	O-ring		X		X		X		X
48-19-2B	16101-102	2	Back-up Washer		X		X		X		X
48-19-2C	16015-2	1	O-ring		X		X		X		X
48-20	16045-103	2	Lock Washer		X		X		X		X
48-21	16147-316	2	Cap Screw		X		X		X		X
48-22	16133-8	1	O-ring		X	X					
48-23	72400-545	1	Adapter, Neutral Lockout		X	X					
48-24	16006-6	1	Ball		X	X					
48-25	16003-500	1	O-ring		X	X					
48-26	72400-546	1	Pin		X	X					
48-27	102149-019	1	#10-32, Set Screw		X	X					
48-28	102147	1	Neutral Lockout Switch		X	X					
48-29	98193	1	Ball Plunger					X	X		
48-30	101335	1	Nut, Seal					X	X		

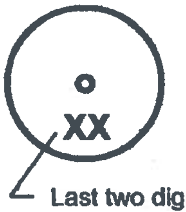
Item 51, 52, or 53 -

Orifice Sizes Available

Item 51,52, or 53

Orifice Sizes Available

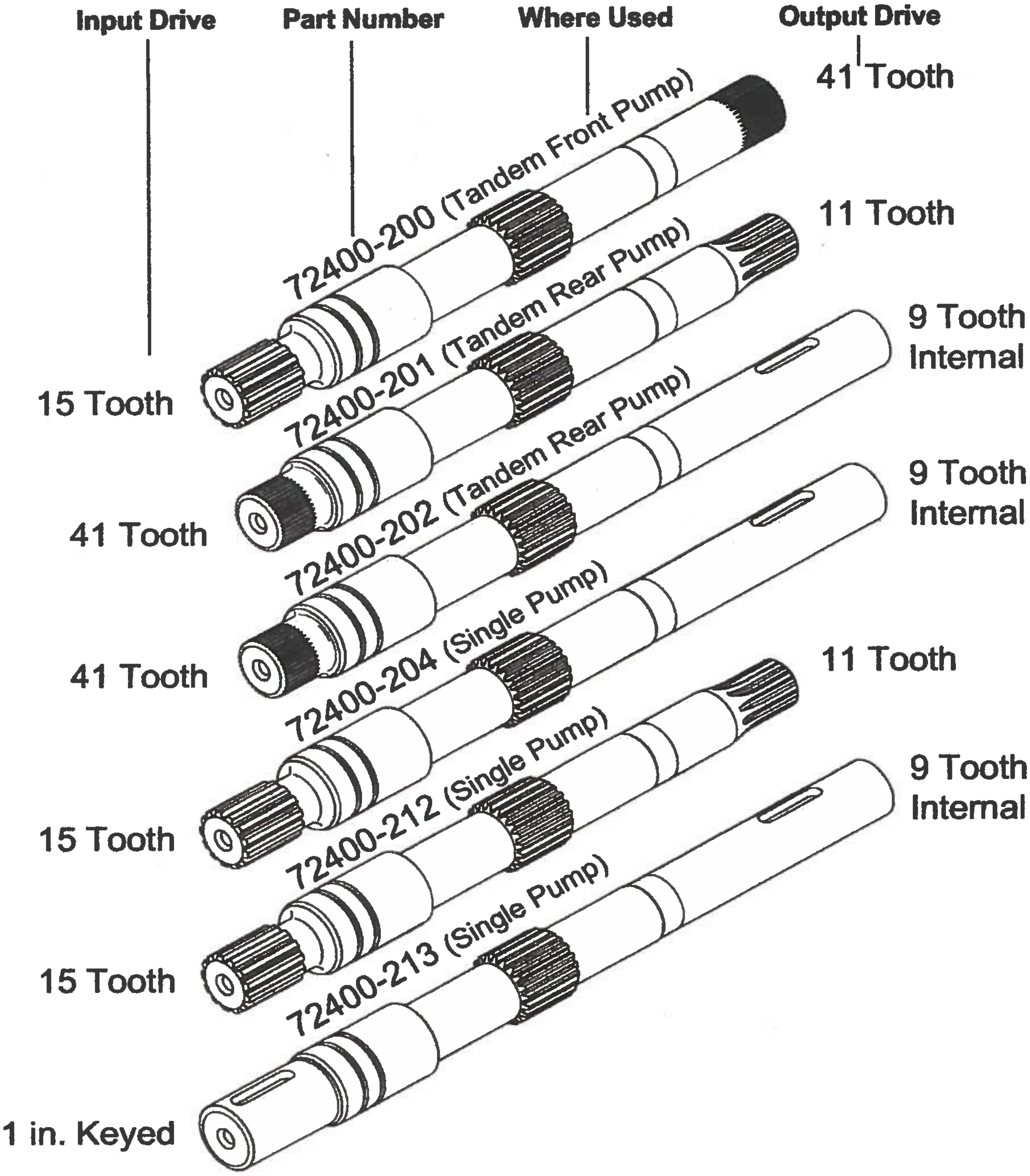
Part Number	Hole Dia. mm [inches]
101619-021	.53 [.021]
101619-028	.71 [.028]
101619-036	.91 [.036]
101619-040	1.02 [.040]
101619-044	1.12 [.044]
101619-048	1.22 [.048]
101619-052	1.32 [.052]
101619-057	1.45 [.057]
101619-065	1.65 [.065]
101619-073	1.85 [.073]
101619-094	2.38 [.094]
101619-102	2.59 [.102]



Last two digits of dash number stamped on face of orifice.

Item 31 -

Drive Shaft Identification



Each order must include the following information.

1. Product and/or Part Number
2. Serial Number Code
3. Part Name
4. Quantity

Identification Numbers - Servo Control Piston Pump

Stamped on each units mounting flange.

A - Product Number Discription
72400 = Single Piston Pump
78461 = Tandem Piston Pump
78462 = Single or Tandem Piston Pump with Gear Pump
B - Sequential Numbering
C - Design Code Number

Single Pump - Product Number:

72400 - 002 - 03
A B C

Tandem Pumps - Product Number:

78461 - 002 - 03
A B C

Serial Number Code:

B 91 01 31 JB

B - Revision level of parts list.
91 - Last two digits of year built. (91 for 1991 etc.)
01 - Month (two digits)
31 - Day of Month (two digits)
JB - Testers Initials

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Form No. 6-633

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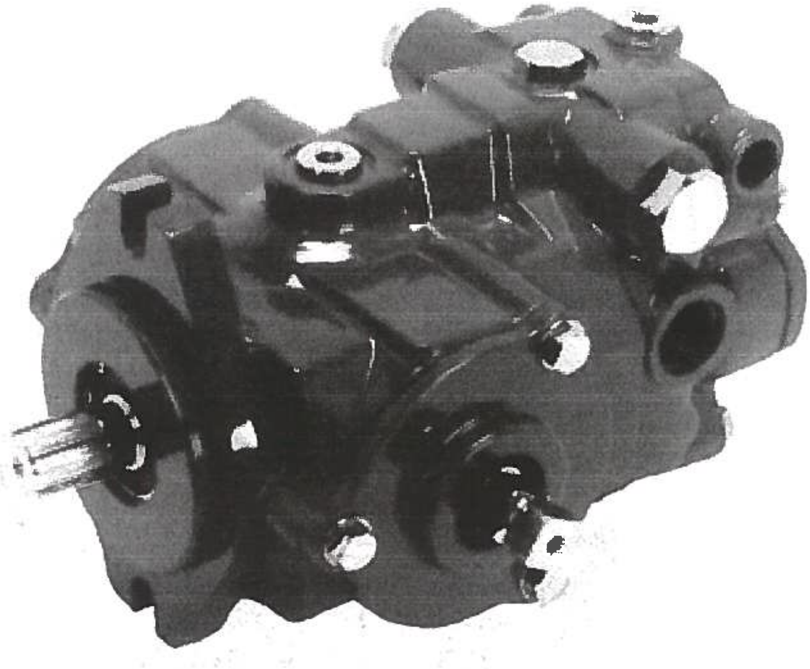
EATON

Eaton®
Medium Duty Piston Pump

No. 6-637
January 1998

Parts and Repair Information



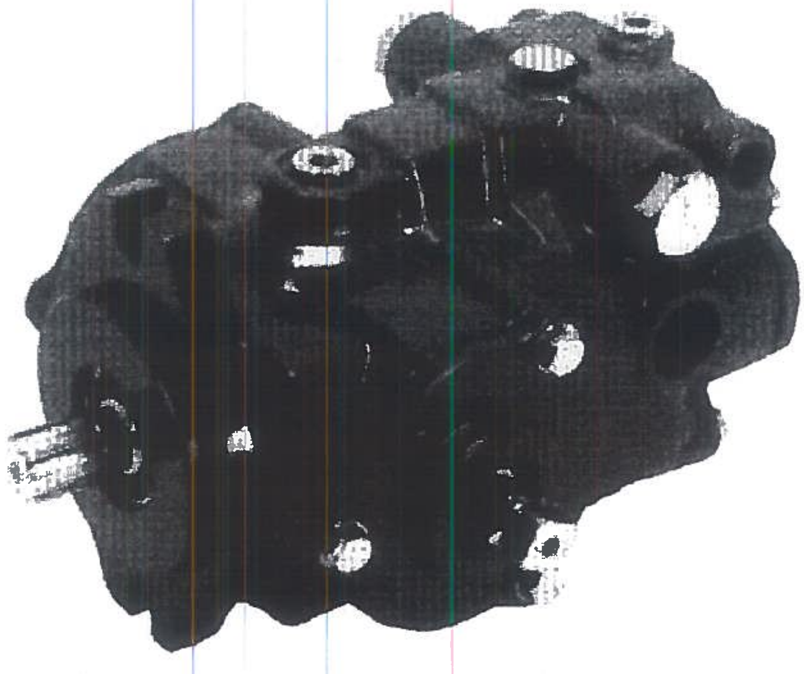
Model 70360 Variable Displacement Piston Pump
40,6 cm^3/r [2.48 in^3/r] or 49,2 cm^3/r [3.00 in^3/r] Displacements
Manual Controlled

EATON | Hydraulics

Medium Duty Piston Pump

Model 70360 Variable Displacement Piston Pump

40,6 cm³/r [2.48 in³/r] or 49,2 cm³/r [3.00 in³/r] Displacements
Manual Controlled



Introduction

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Introduction

This manual provides service information for Eaton Models 70360 variable displacement piston pumps. Step by step instructions for the complete disassembly, inspection, and reassembly of the pump are given. The following recommendations should be followed to insure successful repairs.

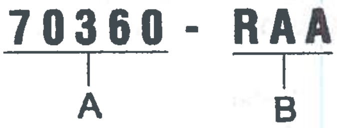
- Remove the pump from the application.
- Cleanliness is extremely important.
- Clean the port areas thoroughly before disconnecting the hydraulic lines.
- Plug the pump ports and cover the open hydraulic lines immediately after they're disconnected.
- Drain the oil and clean the exterior of the pump before making repairs.
- Wash all metal parts in clean solvent.
- Use compressed air to dry the parts. Do not wipe them dry with paper towels or cloth.
- Compressed air should be filtered and moisture free.
- Always use new seals when reassembling hydraulic pumps.
- Lubricate the new rubber seals with a petroleum jelly (Vaseline®) before installation.
- Torque all bolts over gasketed joints, then repeat the torquing sequence to makeup for gasket compression.
- Verifying the accuracy of pump repairs on an authorized test stand is essential.

Identification Numbers - Manually Variable Displacement Piston Pump

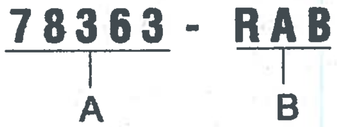
Stamped on each unit's mounting flange.

A - Product Number Description
70360 = Single Piston Pump
78382 = Single Piston Pump with Gear Pump
78361 = Tandem Piston Pumps
78363 = Tandem Piston Pumps with Gear Pump
B - Sequential Numbering

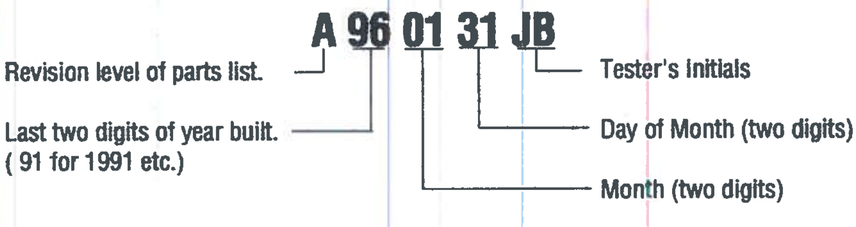
Single Pump - Product Number:



Tandem Pumps - Product Number:



Serial Number Code:


A 96 01 31 JB
Revision level of parts list.
Last two digits of year built. (91 for 1991 etc.)
Tester's Initials
Day of Month (two digits)
Month (two digits)

Each order must include the following information.

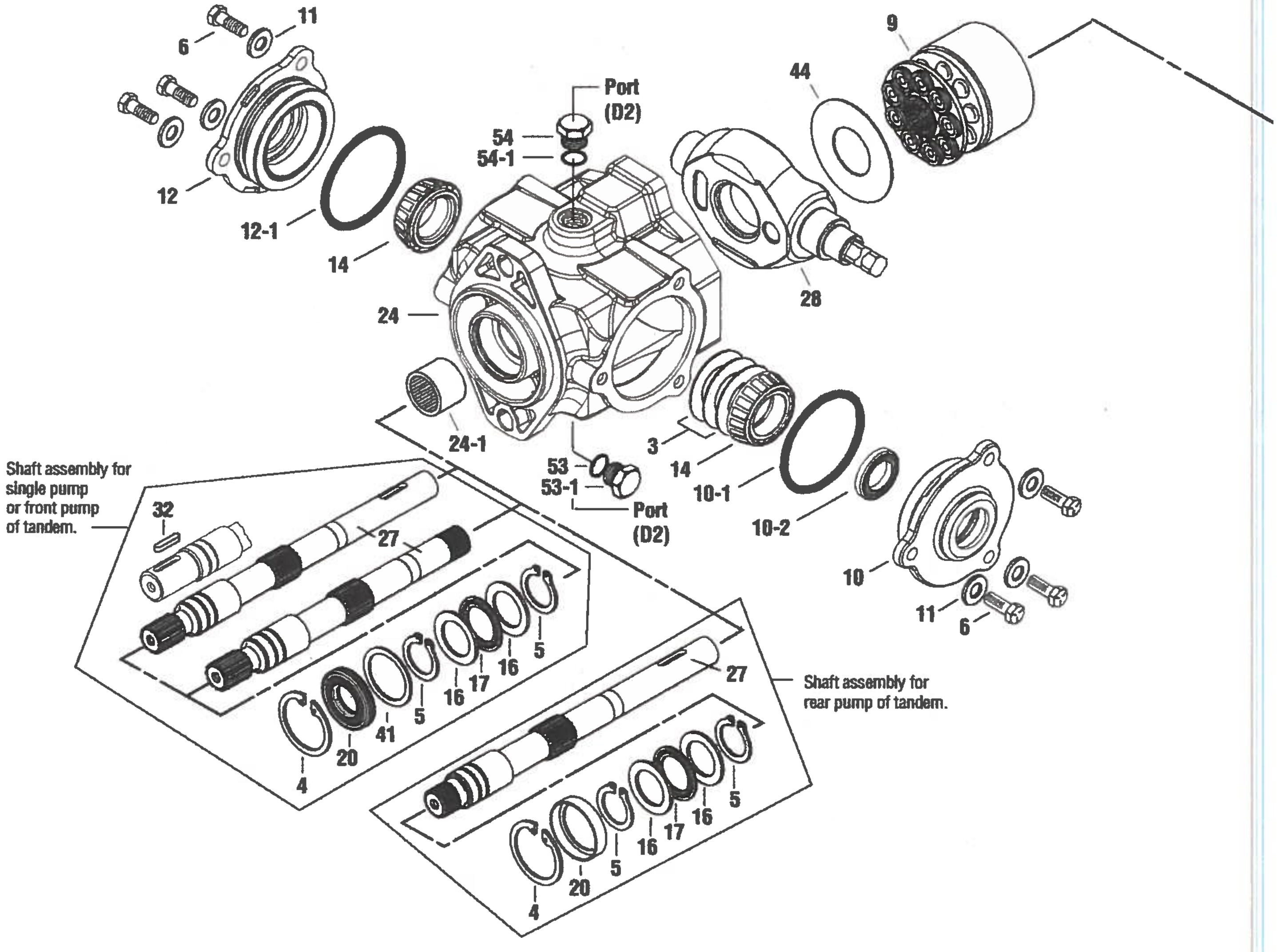
1. Product and/or Part Number
2. Serial Number Code
3. Part Name
4. Quantity

Tools Required

- 9/16, 7/8, 1-1/8 in. sockets and/or end wrenches
- Torque wrench (203 N·m [150 lbf·ft] capacity)
- Ratchet wrench
- 7/16 in. Allen wrench or bit socket
- Internal and external retaining ring pliers
- Small screwdrivers (2)
- Hammer (soft face)
- Light Petroleum Jelly
- Seal driver or similar tool

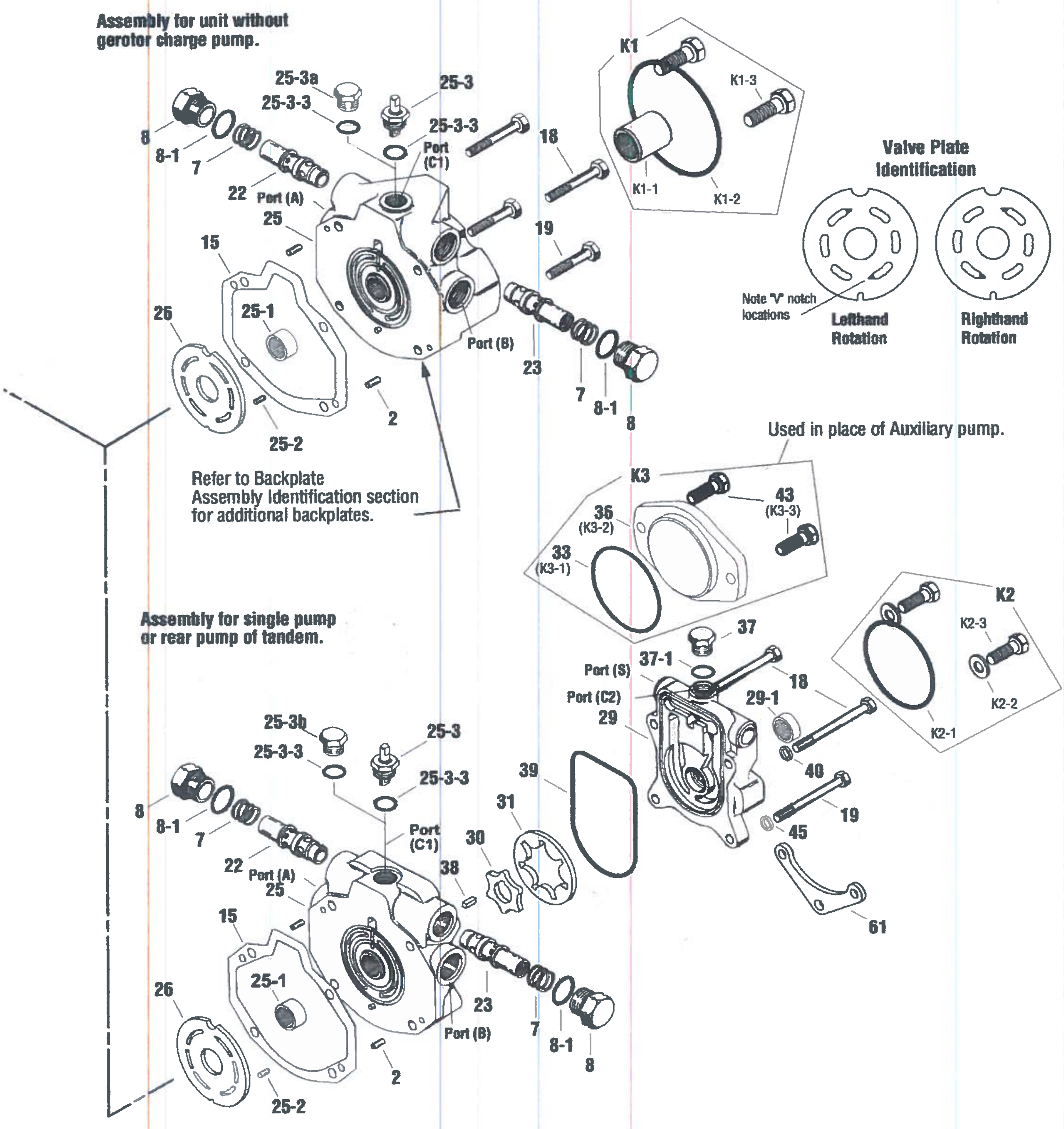
Parts Drawing

Pump drawn below is typical of a righthand rotation pump.



Parts Drawing

Assembly for unit without gerotor charge pump.



Refer to Backplate Assembly Identification section for additional backplates.

Used in place of Auxiliary pump.

Assembly for single pump or rear pump of tandem.

Parts List

Item	Part No.	Qty.	Description
2	16028-404	2	Dowel Pin
3	16322-xxx	A/R	Shims
+ 4	16077-32	1	Retaining Ring
+ 5	16078-18	2	Retaining Ring
6	16032-610	6	Screw
7	17079-2	2	Spring
8	32060-8	2	Plug Assembly
+ 8-1	16015-18-90	2	O-ring, 2,38 mm Dia. x 22,23 mm I.D. [.0937 in. Dia. x .875 in. I.D.]
9	◆	1	Rotating Kit Assembly (parts list on page #8)
10	70360-508	1	Cover Plate SA
+ 10-1	16003-40	1	O-ring, 4,76 mm Dia. x 85,73 mm I.D. [.1875 in. Dia. x 3.375 in. I.D.]
10-2	16253-16	1	Seal, Trunnion Shaft
11	16048-113	6	Washer
12	70360-507	1	Cover Plate SA
+ 12-1	16003-40	1	O-ring, 4,76 mm Dia. x 85,73 mm I.D. [.1875 in. Dia. x 3.375 in. I.D.]
14	16320-122	2	Bearing Cone
+ 15	70412-626	1	Housing Gasket
16	74308-100	2	Thrust Race
17	74308-101	1	Needle Thrust Bearing
18	◆	2	Cap Screws (Locations on page #8)
	16032-622		3/8-16, 57,2 mm [2.25 in.] Long
	16040-640		3/8-16,101,6 mm [4.0 in.] Long
19	◆	2	Cap Screws (Locations on page #8)
	16032-616		3/8-16, 38,1 mm [1.5 in.] Long
	16032-620		3/8-16, 50,8 mm [2.0 in.] Long
	16032-632		3/8-16, 82,6 mm [3.25 in.] Long
+ 20	16253-18	1	Shaft Seal, Drive
20	16253-218	1	Shaft Seal, Drive (fluorocarbon rubber)
20	70400-620	1	Spacer (Used in rear pump of tandem in place of drive shaft seal.)
22	◆	1	Relief Valve for Port "A" (Identification drawing on page #9)
23	◆	1	Relief Valve for Port "B" (Identification drawing on page #9)
24		1	Housing Assembly
	70360-302	1	with drain port D1 and D2
	70360-309	1	with drain port D1, D2, and D3
24-1	16238-11816	1	Bearing (press fit)
25	◆	1	Backplate Assembly (Identification drawing and parts list on page #10 & #11)
26		1	Valve Plate (Identification drawing on page #5)
	70344-51		Righthand (CW) Rotation
	70344-52		Lefthand (CCW) Rotation
27	◆	1	Drive Shaft (Identification drawing on page #14)
28	◆	1	Camplate
	70360-606	1	Square End Trunnion
29	◆	1	Charge Pump Adaptor (Identification drawing and parts list on page #12 & #13)
30		1	Inner Gerotor
	79004-611		6,9 cm^3/r [.42 in^3/r] displacement, 6,35 mm [.25 in] width
	79004-605		13,8 cm^3/r [.84 in^3/r] displacement, 12,7 mm [.5 in] width
31		1	Outer Gerotor
	79004-612		6,9 cm^3/r [.42 in^3/r] displacement, 6,35 mm [.25 in] width
	79004-606		13,8 cm^3/r [.84 in^3/r] displacement, 12,7 mm [.5 in] width
32		1	Key, Drive Shaft
	16246-516		Used with 25,4 mm[1.00 in] dia. drive shaft.
	24500-619		Used with 22,2 mm [.875 in] dia. drive shaft.
33	16007-14	1	O-ring (In K2 & K3 kit)
34	70411-613	1	Coupler
35	70411-605	1	Mounting Bracket

Parts List

	36	70142-600	1	Cover Plate (In K3 kit)
	37	16103-108	1	Plug Assembly
+	37-1	16133-8	1	O-ring, 2,21 mm Dia. x 16,36 mm ID. [.087 in. Dia. x .644 in. ID.]
	38	15222-20	1	Key, Gerotor Pump Adapter
+	39	70342-600	1	Molded O-ring
	40	16048-113	2	Washer
	41	16048-319	1	Washer
	42	16246-523	1	Key, Camplate Trunnion
	43	16032-610	2	Cap Screws, Cover Plate (In K3 kit)
	44	70300-604	1	Insert, Camplate
	45	16048-113	6	Washer
	53	16103-308	1	Plug Assembly
+	53-1	16133-8	1	O-ring, 2,20 mm Dia. x 16,35 mm ID. [.087 in. Dia. x .644 in. ID.]
	54	16103-308	1	Plug Assembly
+	54-1	16133-8	1	O-ring, 2,20 mm Dia. x 16,35 mm ID. [.087 in. Dia. x .644 in. ID.]

Mounting Kits

K1	70342-905	1	Tandem Piston Pump Mounting Kit
K1-1	70411-622	1	41T Coupler 33,02 mm [1.3 in.] long
K1-2	16007-17	1	O-ring, 1,59 mm Dia. x 101,6 mm ID. [.0625 in. Dia. x 4 in. ID.]
K1-3	16032-812	2	Cap Screws
K2	70442-929	1	Gear Pump Mounting Kit
K2-1	16007-14	1	O-ring, 1,59 mm Dia. x 82,55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K2-2	16048-113	1	Washer
K2-3	16032-610	2	Cap Screws
K3	70142-915	1	Cover Plate Kit
K3-1	16007-14	1	O-ring, 1,59 mm Dia. x 82,55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K3-2	70142-600	1	Cover Plate
K3-3	16032-610	2	Cap Screws

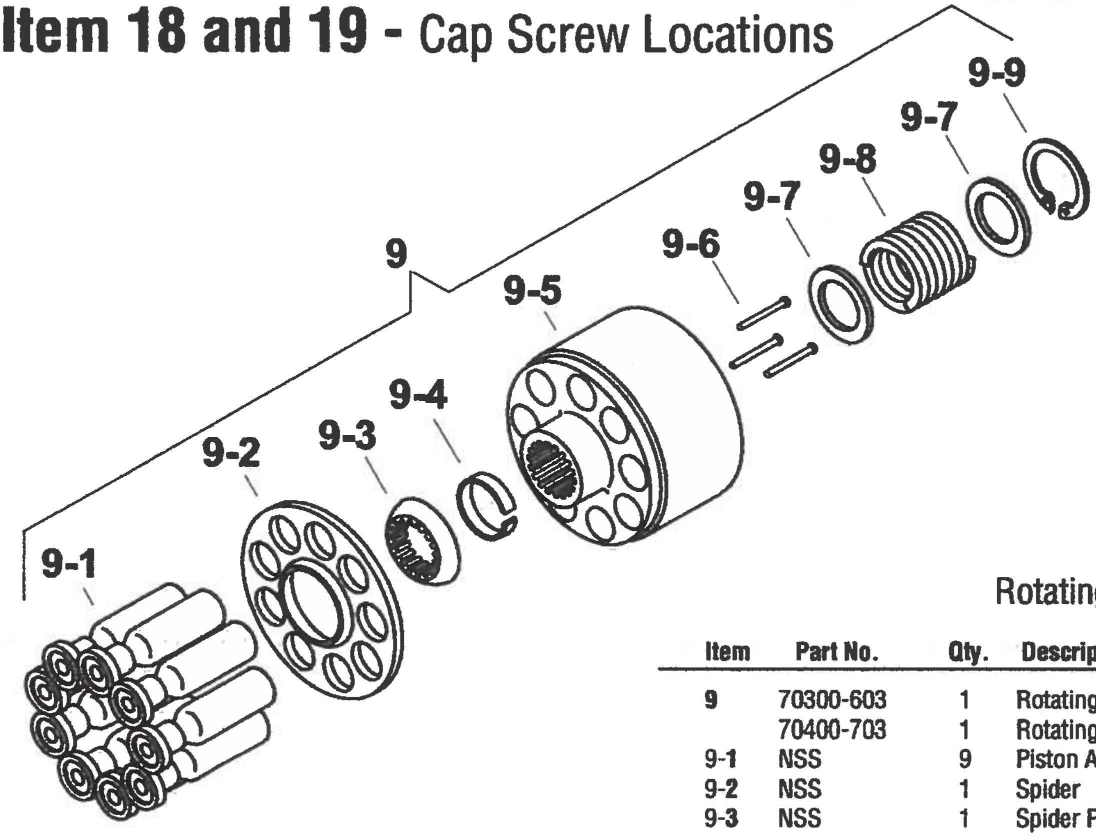
Seal Repair Kits

•	70360-900	1	Seal Repair Kit for 70360 piston pump. (Order two for tandem pumps)

Legend

◆ Refer to specific item parts list.
+ Common parts to seal repair kits.

Item 9 - Rotating Kit Assembly
Item 18 and 19 - Cap Screw Locations

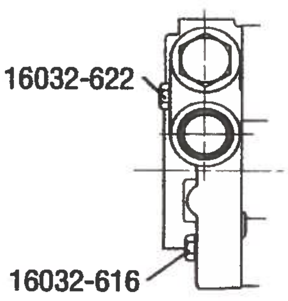


Item 9
Rotating Kit Assembly

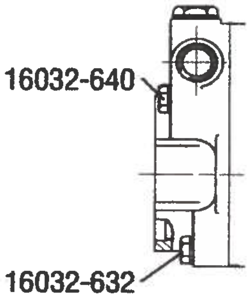
Item	Part No.	Qty.	Description
9	70300-603	1	Rotating Kit Assy. 2.48 in³/r
	70400-703	1	Rotating Kit Assy. 3.00 in³/r
9-1	NSS	9	Piston Assembly
9-2	NSS	1	Spider
9-3	NSS	1	Spider Pivot
9-4	NSS	1	Retainer
9-5	NSS	1	Piston Block
9-6	NSS	3	Pins
9-7	NSS	2	Washer
9-8	NSS	1	Spring
9-9	NSS	1	Retaining Ring

NSS - Not Sold Separately

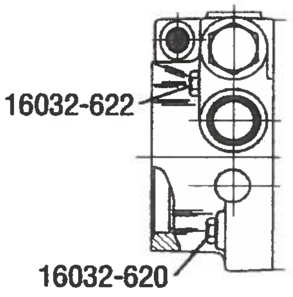
Item 18 and 19
Cap Screw Locations



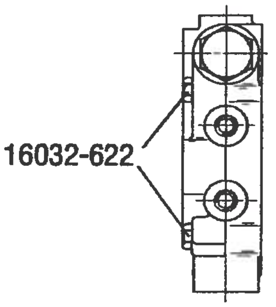
**Rear "A" Flange,
without Gerotor,
Opposite Side Porting**



**Rear "A" Flange,
with Gerotor,
Opposite Side Porting**



**Rear "B" Flange,
without Gerotor,
Opposite Side Porting**



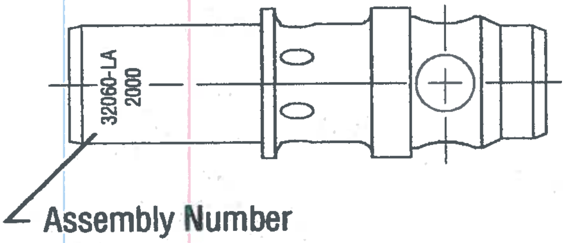
**Rear "A" Flange,
without Gerotor,
Same Side Porting**

Item 22 or 23 - Relief Valve

Item 22 or 23

Internal Relief Valve Settings Available

Part Number	bar [PSI]
32060-LA	138 [2000]
32060-QA	172 [2500]
32060-UA	207 [3000]
32060-WA	241 [3500]
32060-ZA	276 [4000]
32060-XA	310 [4500]
32060-IA	345 [5000]
70111-518	Seat, Valve



Assembly Number and Pressure Setting

Item 25 -

Backplate Assembly Identification

Item 25 - Parts List (Refer to Identification chart and drawings)

	Item	Part No.	Qty.	Description
	25	See Chart Below		Backplate Assembly
	25-**1**	52200-23	1	Bearing
	25-**2**	16026-610	1	Dowel Pin
	25-**3**	70300-610	1	Bypass Valve Assembly
+	25-3-**1**	16078-6	1	Retaining Ring
	25-3-**2**	70300-609	1	Separator Plug
+	25-3-**3**	16133-8	1	O-ring, 2,38 mm Dia. x 16,27 mm I.D. [.0937 in. Dia. x .6406 in. I.D.]
	25-3-**4**	70411-502	1	Speader
+	25-3-**5**	16003-7	1	O-ring, 1,59 mm Dia. x 9,53 mm I.D. [.0625 in. Dia. x .375 in. I.D.
	25-**3a**	16103-108	1	Plug Assembly, Hex
+	25-3-**3**	16133-8	1	O-ring, 2,38 mm Dia. x 16,27 mm I.D. [.0937 in. Dia. x .6406 in. I.D.]
	25-**3b**	16103-308	1	Plug Assembly, Internal Hex Socket
+	25-3-**3**	16133-8	1	O-ring, 2,38 mm Dia. x 16,27 mm I.D. [.0937 in. Dia. x .6406 in. I.D.]

Legend + Common parts to seal repair kits listed.

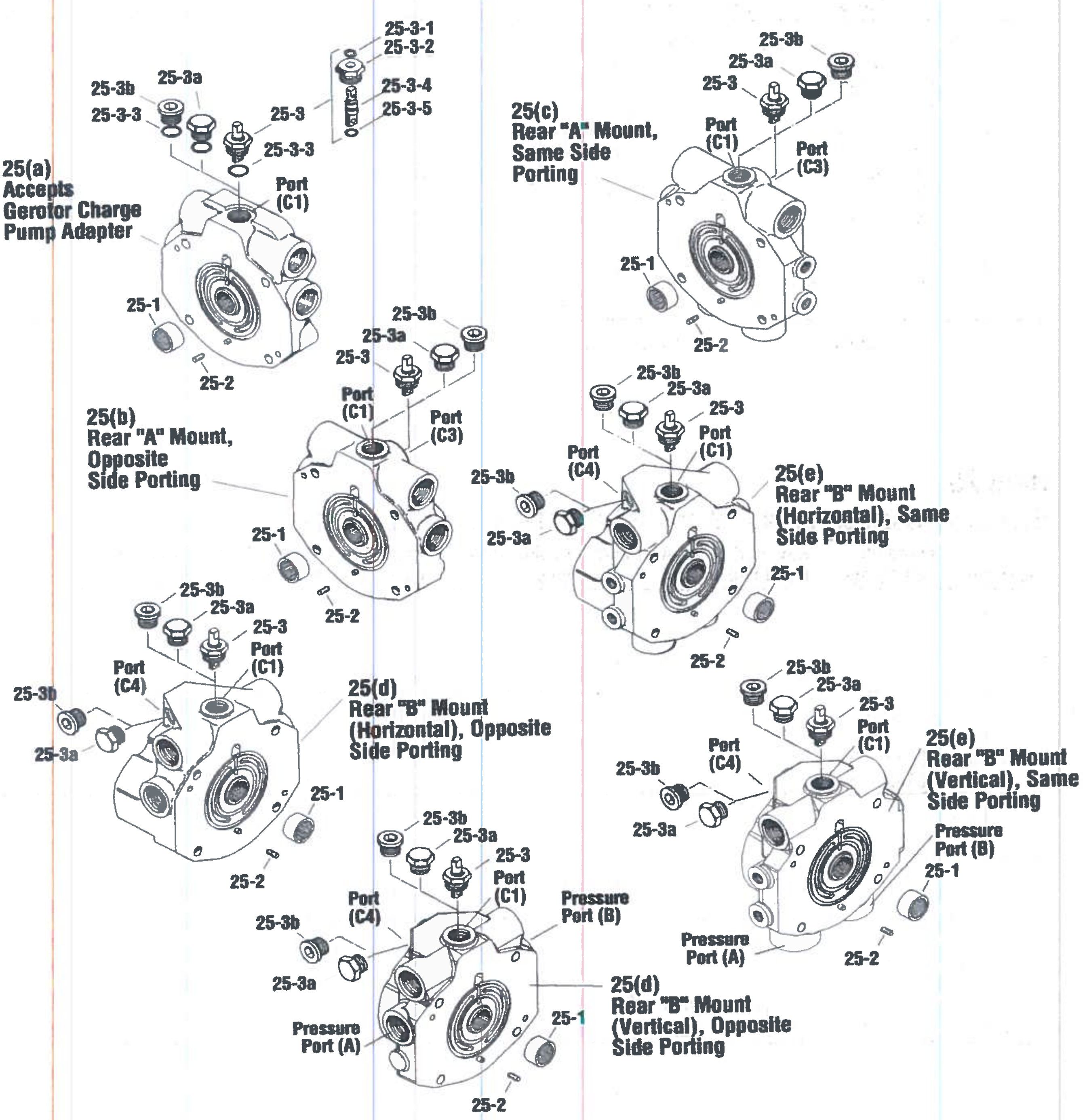
Item 25

Backplate Assembly Identification (Refer to drawings on page #11)

Description	Assembly Part Number	Aux. Port Machined	C1 Aux. Port Plug	C3 Aux. Port Plug	C1 Aux. Port Bypass Valve	C3 Aux. Port Bypass Valve	C4 Aux. Port Plug
25(a) - Accepts Gerotor Charge Pump	70300-413	C1	Item 25-3a				
	70300-426	C1			Item 25-3		
25(b) - Rear 'A' Mount, Opposite Side Porting	70300-409	C1					
	70300-415	C1, C3				Item 25-3	
25(c) - Rear 'A' Mount, Same Side Porting	70300-403	C1, C3	Item 25-3a				
	70300-421	C1, C3		Item 25-3b			
	70300-437	C1, C3	Item 25-3b				
25(d) - Rear 'B' Mount, Opposite Side Porting Horizontal	70300-407	C1					
	70300-411	C1, C4			Item 25-3		
	70300-439	C1, C4	Item 25-3a				
Vertical	70360-413	C1, C4	Item 25-3a				
25(e) - Rear 'B' Mount, Same Side Porting Horizontal	70300-401	C1, C4	Item 25-3a				
	70300-418	C1, C4					Item 25-3a
Vertical	70360-411	C1, C4	Item 25-3a				

Item 25 -

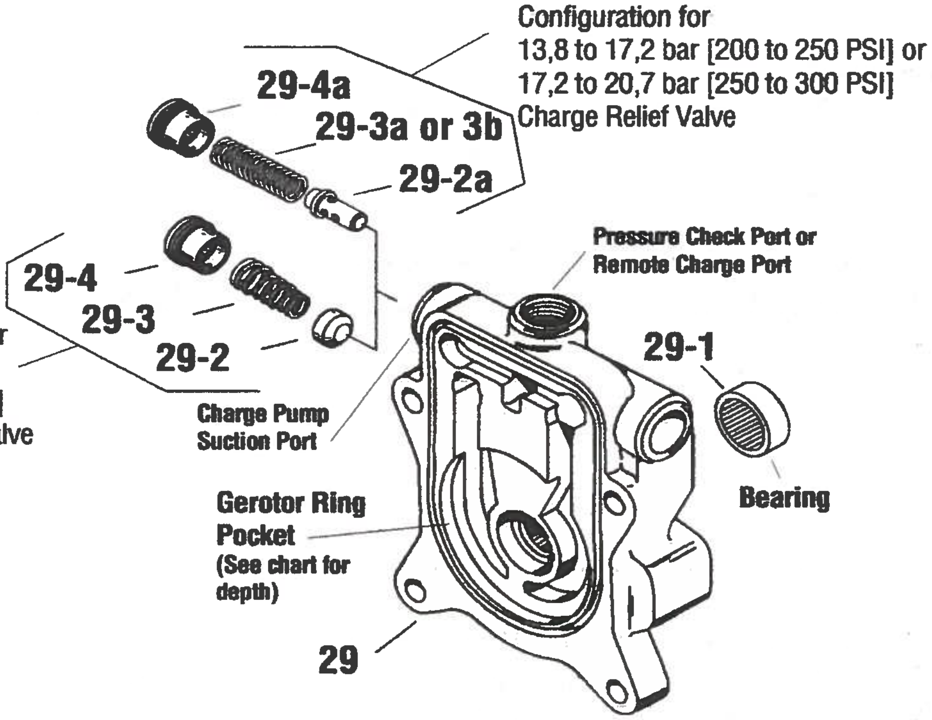
Backplate Assembly Identification



Item 29 -

Charge Pump Adapter Assembly Identification

Righthand Rotation

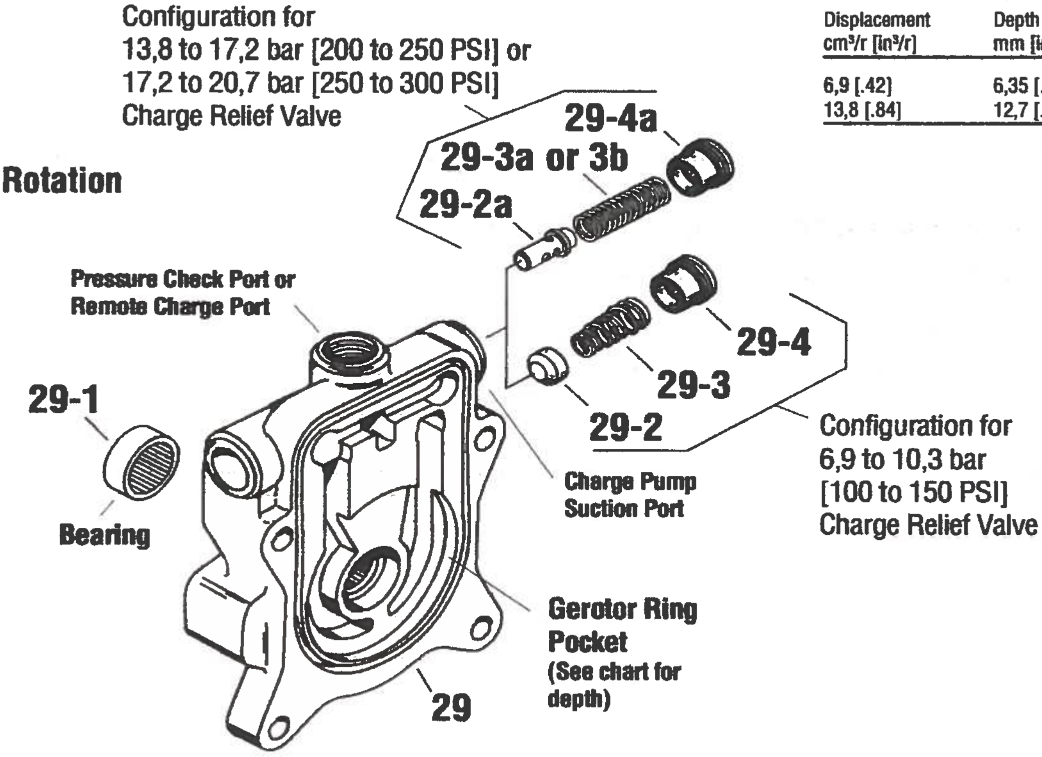

Configuration for
13,8 to 17,2 bar [200 to 250 PSI] or
17,2 to 20,7 bar [250 to 300 PSI]
Charge Relief Valve

Configuration for
6,9 to 10,3 bar
[100 to 150 PSI]
Charge Relief Valve

Gerotor Pocket Depth

Displacement cm³/r [in³/r]	Depth of Pocket mm [in.]
6,9 [.42]	6,35 [.25]
13,8 [.84]	12,7 [.50]

Lefthand Rotation


Configuration for
13,8 to 17,2 bar [200 to 250 PSI] or
17,2 to 20,7 bar [250 to 300 PSI]
Charge Relief Valve

Configuration for
6,9 to 10,3 bar
[100 to 150 PSI]
Charge Relief Valve

Item 29 -

Charge Pump Adapter Assembly

No Charge Relief

Item	Part No.	Qty.	Description	Rotation	Displacement
29	70440-369	1	Assembly, Charge Pump Adapter	Righthand	13,8 cm^3/r [.84 in^3/r]
29-1	16239-1148	1	Bearing (press fit)		

6.9 to 10.3 bar [100 to 150 PSI] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
29	70442-356	1	Assembly, Charge Pump Adapter	Righthand	6,88 cm^3/r [.42 in^3/r]
	70442-368	1	Assembly, Charge Pump Adapter	Lefthand	13,8 cm^3/r [.84 in^3/r]
	70442-374	1	Assembly, Charge Pump Adapter	Righthand	13,8 cm^3/r [.84 in^3/r]
	70442-389	1	Assembly, Charge Pump Adapter	Lefthand	6,88 cm^3/r [.42 in^3/r]
29-1	16239-1148	1	Bearing (press fit)		
29-2	70111-507	1	Poppet, Cup		
29-3	17000-48B	1	Spring, Tapered		
29-4	70400-505	1	Spring Retainer		

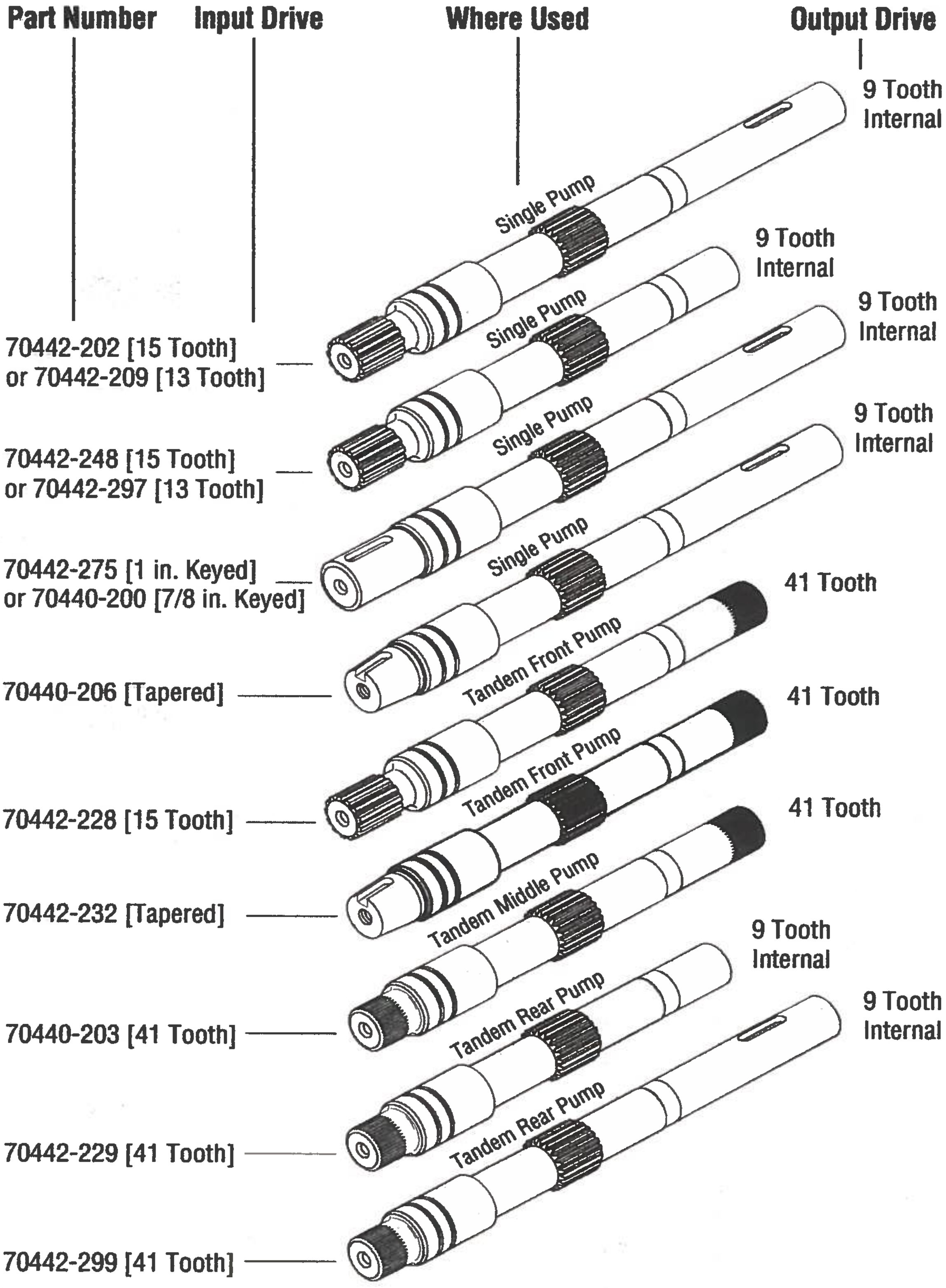
13.8 to 17.2 bar [200 to 250 PSI] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
29	70440-388	1	Assembly, Charge Pump Adapter	Lefthand	6,88 cm^3/r [.42 in^3/r]
	70440-389	1	Assembly, Charge Pump Adapter	Righthand	6,88 cm^3/r [.42 in^3/r]
	70440-385	1	Assembly, Charge Pump Adapter	Righthand	13,8 cm^3/r [.84 in^3/r]
29-1	16239-1148	1	Bearing (press fit)		
29-2a	70400-727	1	Poppet, Pin		
29-3a	17056-40	1	Spring, Color "Light Green"		
29-4a	70400-512	1	Spring Retainer		

17.2 to 20.7 bar [250 to 300 PSI] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
29	70440-381	1	Assembly, Charge Pump Adapter	Righthand	6,88 cm^3/r [.42 in^3/r]
	70440-390	1	Assembly, Charge Pump Adapter	Righthand	13,8 cm^3/r [.84 in^3/r]
29-1	16239-1148	1	Bearing (press fit)		
29-2a	70400-727	1	Poppet, Pin		
29-3b	17056-41	1	Spring, Color "Pink"		
29-4a	70400-512	1	Spring Retainer		

Item 27 - Drive Shaft Identification



Repair Information

Disassembly

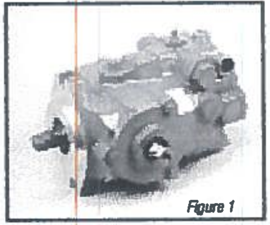


Figure 1

The following disassembly procedure applies to a single pump with or without gear pump The repair procedure for tandem pumps, once they are separated, is basically the same. The basic configuration differences between a single and tandem pumps are the backplates, pump shafts and housing assemblies. In most cases, only the rear pump of tandem units contain a charge pump, which is common to both the front and rear pump. The rear tandem pump does not incorporate a shaft seal.

Thoroughly clean the Eaton Model 70360 or 78362 variable displacement pump before any repairs are attempted. When working on tandem pumps, separate the front and rear pumps first.

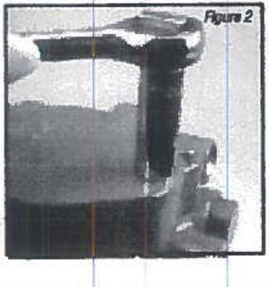


Figure 2

1 Support the pump with the input shaft down. Use a 9/16 in. socket or end wrench to remove the pump adapter cover plate or gear pump. (See Figure 2)

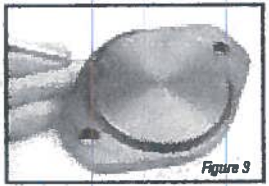


Figure 3

2 Use a pick or similar tool to remove the adapter cover plate or gear pump o-ring. (See Figure 3)

3 Use a 7/16 in. Allen wrench or bit socket remover to remove the charge pressure relief valve spring retainer from the pump adaptor assembly. (See Figure 4)

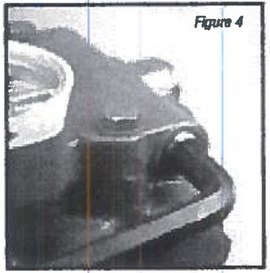


Figure 4

4 Use a pencil magnet or similar tool to carefully remove the charge pressure spring and poppet from the pump adaptor assembly. (See Figure 5) Use caution not to drop the charge pump poppet into the pump adaptor assembly.

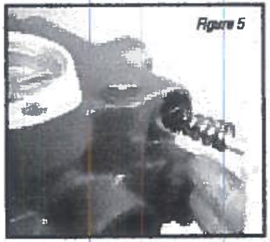


Figure 5

5 The charge pressure relief valve and poppet may be of the standard or high pressure type. The (6.9 to 10.3 bar [100 to 150 PSI]) standard spring and poppet are shown on the bottom and the optional high pressure (13.7 to 20.7 bar [200 to 300 PSI]) spring and poppet is shown on the top. The same charge pressure relief valve spring retainer is used with either the standard or high pressure.(See Figure 6)

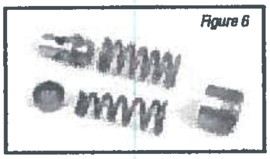


Figure 6

6 Use a 7/8 in. socket or end wrench to remove the optional bypass valve assembly from the backplate. (See Figure 7)

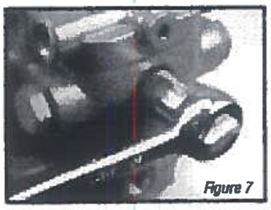


Figure 7

7 The internal seal may be replaced by first removing the small retaining ring on the end of the bypass valve. Remove and replace the o-rings. (See Figure 8)

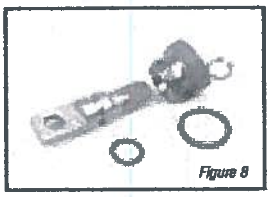


Figure 8

8 Use a 1-1/16 in. socket or end wrench to remove the two high pressure relief valves from the pumps backplate assembly. (See Figure 9) Each system relief valve assembly is identified by both its part number and relief valve setting as shown on page 9.

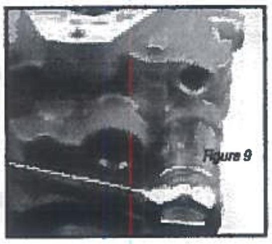


Figure 9

9 Firmly support the pump assembly. Use a 9/16 in. socket or end wrench to remove the four cap screws retaining the charge pump adapter assembly.

10 With the cap screws removed, remove the charge pump adaptor assembly from the backplate.(See Figure 11)

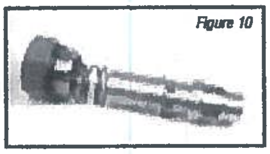


Figure 10

Note: The front pump assemblies do not have charge pump adapter assemblies.

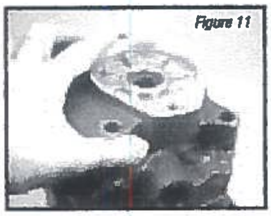


Figure 11

11 Turn the adapter assembly over. Use an o-ring pick or similar tool remove the o-ring seal. (See Figure 12)

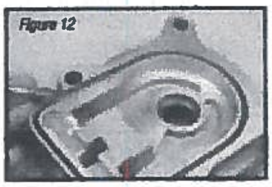


Figure 12

12 Inspect the gerotor pocket and *needle bearing located in the charge pump adapter. The needles in the needle bearing must remain intact in the bearing cage.*

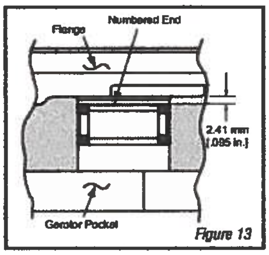


Figure 13

13 When the needle bearing assembly is replaced, the numbered end of the bearing must face toward the flange side of the adapter to the dimension as shown. (See Figure 13)

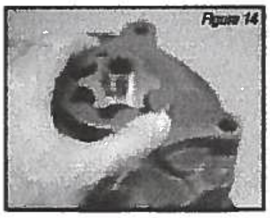


Figure 14

14 With the charge pump adapter removed, remove the charge pump assemblies outer and inner gerotor ring. Next, remove the small drive key from the pump shaft. (See Figure 14 and 15)

15 Charge pumps are available in two different displacements Charge pump displacements are based on the thickness of the gerotor assembly and the depth of the pocket located in the charge pump adapter. To determine the displacement, refer to the table below.

Gerotor Pocket Depth

Displacement cm^3/r **[in^3/r]**	**Depth of Pocket** **mm [in.]**
6.9 [.42]	6.35 [.25]
13.8 [.84]	12.7 [.50]

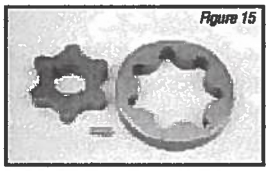


Figure 15

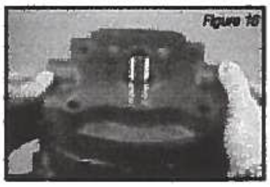


Figure 16

16 To separate the backplate assembly from the dowel pins in the pump housing assembly, insert two screwdrivers between backplate and housing assembly and pry upward. (See Figure 16)

17 After separation, remove the backplate from the housing assembly.

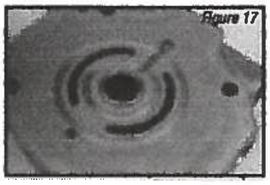


Figure 17

18 Turn the backplate assembly over and inspect the needle bearing. The needles in the needle bearing must remain intact in the bearing cage. (See Figure 17)

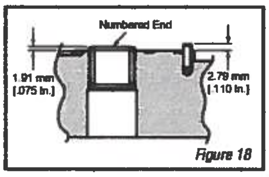


Figure 18

19 When the needle bearing assembly is replaced, the numbered end of the bearing must face the valve plate side of the backplate to the dimension as shown. (See Figure 18)

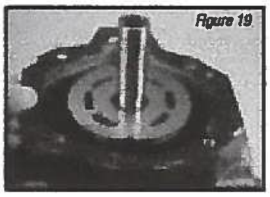


Figure 19

20 With the backplate removed, remove the gasket from the pump housing assembly and discard. (See Figure 19)

21 Remove the valve plate from the piston block assembly. Note: This valve plate may have stuck to the backplate assembly that was just previously removed.

22 Valveplate directional rotation (CW or CCW) is identified by the location of the metering slots located on the face of the valve plates. Pump input rotation should always turn into the metering slots. (See Figure 20) A clockwise valve plate is shown on the left and a counter clockwise valveplate is on the right.

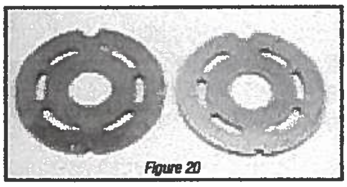


Figure 20

Note: Whenever pump input rotation is changed, the valve plate must be replaced along with the desired rotation charge pump adapter.

23 Remove the rotating kit assembly by carefully retaining it in the housing assembly. Lift the housing and rotating kit assembly and turn over assemblies allowing the rotating kit assembly to slide down the input shaft and out of the pump housing.

24 The model 70360 variable displacement pumps are available in two different displacements. The 40,6 cm^8/r [2.48 in^3/r] rotating kit assembly is shown below on the left. The 49,2 cm^3/r [3.00 in^3/r] rotating kit assembly is shown below on the right. The 49,2 cm^{3}lr [3 00 in^3/r] rotating assembly is easily identified by having larger pistons and cutouts in the spider. (See Figure 21)

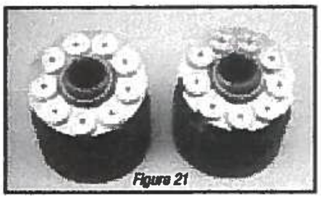


Figure 21

25 With the rotating kit assembly removed, remove the piston assemblies, spider and spider pivot from the piston barrel. (See Figure 22)

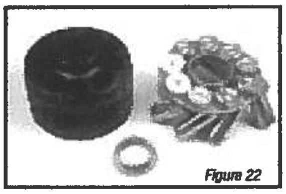


Figure 22

26 Inspect the piston assemblies, spider, spider pivot and piston block. The piston block assembly usually requires no further disassembly unless the pins or block spring are damaged.

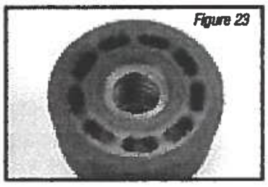


Figure 23

27 When any excessive wear or scratches are noted on the face of the piston block, the block assembly must be replaced. (See Figure 23)

DO NOT LAP THE FACE OF PISTON BLOCK ASSEMBLY.

Repair Information

28 To remove the input shaft assembly, use a pair of internal snap ring pliers and remove the shaft seal retaining ring from the housing assembly. (See Figure 24)

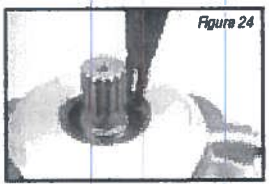


Figure 24

29 With the retaining ring removed, use a small press to press the shaft seal and input shaft assembly from the housing assembly. (See Figure 25)

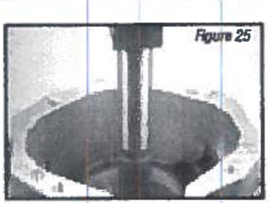


Figure 25

30 With the input shaft assembly removed, disassemble the assembly for inspection by removing the shaft seal, washer, retaining ring thrust washers and bearing. (See Figure 26)

Note: The rear pump on tandem units uses a spacer in place of shaft seals.

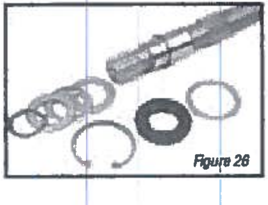


Figure 26

31 To remove the camplate from the housing assembly, use a 9/16 in. socket or end wrench and remove the three cap screws retaining the trunnion coverplate assembly. Start at the cover plate with trunnion controller first. (See Figure 27)

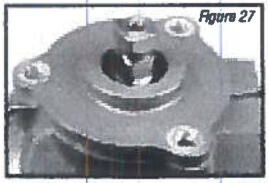


Figure 27

32 With the retaining cap screws removed, insert two small screwdrivers in the notches located in the cover plate assembly and pry upward.

33 Remove the tapered roller bearing from the cam plate. (See Figure 28)

Note: In most cases this tapered roller bearing is a slip-fit on the camplate.

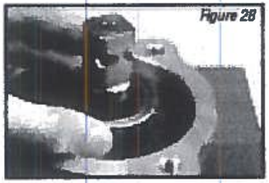


Figure 28

34 With the tapered bearing removed, remove the shims from the camplate. (See Figure 29) Use caution not to misplace or lose these shims. Note: These shims may vary in thickness and are used to adjust camplate end play.

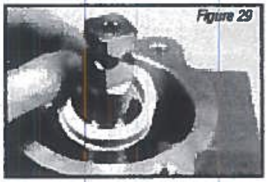


Figure 29

35 Reposition the pump assembly to remove opposite cover plate. Repeat steps 31 through 33.

36 Use an o-ring pick or similar tool remove the o-ring seals from the two cover plates. (See Figure 30)

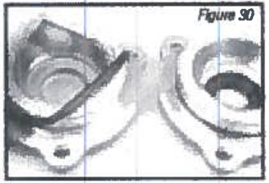


Figure 30

37 To remove the control side cover plate lip seal, use a small press and press the lip seal inward. (See Figure 31)

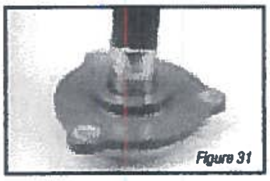


Figure 31

38 With the camplate bearings removed, slide the camplate toward the control side and lift it from the pump housing. (See Figure 32)

Note: The camplate control shaft will fit out either side of the pump housing. Be sure to note on which side of the housing the control shaft protrudes before removing camplate from housing for correct reassembly orientation.

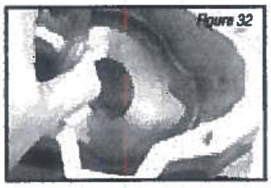


Figure 32

39 Remove the thrust plate from the camplate. The thrust plate is reversible and either side may face the camplate. (See Figure 33)

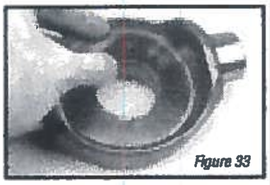


Figure 33

40 Inspect the housing assemblies front needle bearing. If the needles remain in their cage and move freely, replacement usually is not required. (See Figure 34)

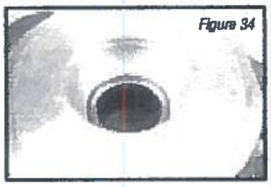


Figure 34

41 When the needle bearing is replaced, the numbered end of the needle bearing must face away from the housing and pressed to the dimension as shown. (See Figure 35)

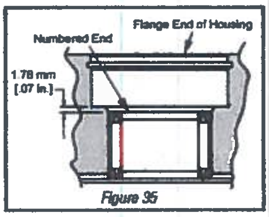


Figure 35

Repair Information

Reassembly

1 Before reassembling the pump, replace all worn and damaged parts, assemblies, seals and o-rings. Lubricate the seals and o-rings with petroleum jelly to help retain them during reassembly and to provide lubrication to the input and control shaft seals. Lubricate all finished part surfaces freely with clean hydraulic fluid to help provide start up lubrication between all rotating parts.

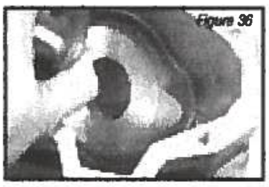


Figure 36

2 To reassemble the camplate into the pump housing, tilt the camplate slightly and install the control side of the camplate through the previously noted or marked side of the housing assembly. (See Figure 36)

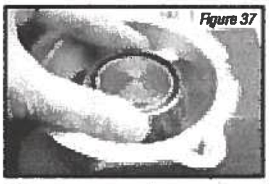


Figure 37

3 With the camplate installed, lubricate and install the tapered bearing on the non-control arm side of the camplate. (See Figure 37)

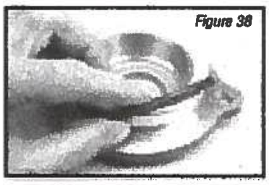


Figure 38

4 Lubricate and install the o-ring seal on trunnion cover. (See Figure 38)

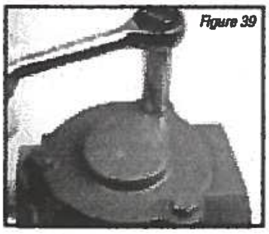


Figure 39

5 Install the trunnion cover over bearing and on pump housing. Install the three cap screws and torque to 40,7 Nm [30 ft. lbs.]. (See Figure 39)

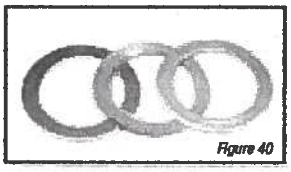


Figure 40

6 Shims are used to adjust the camplate's tapered bearings preload. The shims used may be thick, thin or both. When repairing, start with the same thickness of shims as those removed then add or delete to obtain the proper bearing preload. (See Figure40)

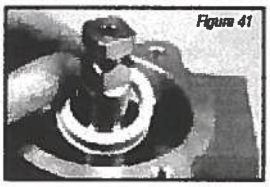


Figure 41

7 Install the shims on the control arm side of the camplate. (See Figure 41)

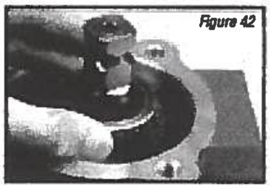


Figure 42

8 With the shims installed, lubricate and install the tapered bearing on the control arm side of the camplate. (See Figure 42)

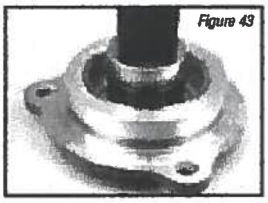


Figure 43

9 Lubricate and install the control arm shaft seal into the control arm trunnion cover. Install with the lip of the seal facing upward or to the inside of the pump. (See Figure 43)

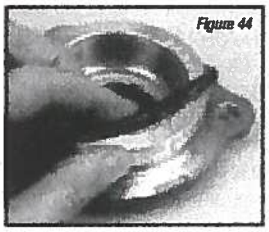


Figure 44

10 Lubricate and install the o-ring seal on the control arm trunnion cover. (See Figure 44)

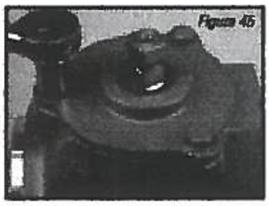


Figure 45

11 Install the trunnion cover over the control shaft and into the pump housing. Install the three retaining cap screws and torque to 40,7 Nm [30 ft. lbs.]. (See Figure 45)

12 Using your fingers, tilt the camplate back and forth to check the trunnion bearing preload. Proper preload is achieved when the camplate has a very slight tilting resistance. The camplate must not have any or very little side clearance.

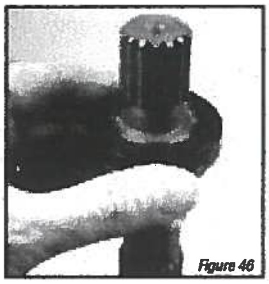


Figure 46

13 Reassemble the input shaft assembly by installing the thrust washer, thrust bearing, second thrust washer, retaining ring, washer and shaft seal. (See Figure46)

Note: The lip of the shaft seal must point toward the center of the input shaft.

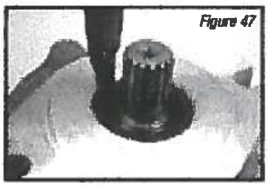


Figure 47

14 Install the input shaft assembly into the housing assembly. Push the shaft seal in just far enough so you can start the shaft seal retaining ring.

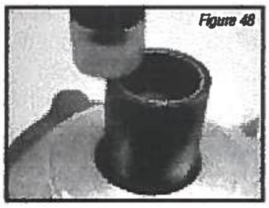


Figure 48

15 Use a pair of snap ring pliers to install retaining snap ring into the housing assembly. (See Figure 47)

16 Use a seal driver or similar tool to press or drive the snap ring and seal into the housing assembly. (See Figure 48)

CAUTION! Press or drive inward until the snap ring snaps into the snap ring groove located in the pump housing assembly.

Repair Information

17 The thrust plate is reversible. Either side will fit into the camplate. In most cases if any irregularities are noted it is best to replace the thrust plate. (See Figure 49)

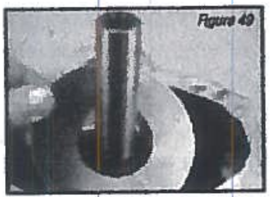


Figure 49

18 Lubricate and install the thrustplate over the input shaft assembly and into the camplate. The thrustplate must rest firmly in its pocket located in the camplate.

19 Reassemble the rotating kit assembly by first aligning the splines in the pivot with the splines in the block. Install the pivot on the block assembly pins. (See Figure 50)

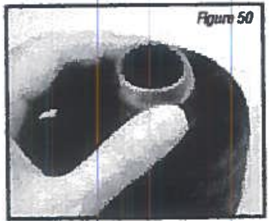


Figure 50

20 Use a small socket or similar tool to help retain the pivot in the centered position. Lubricate and install the spider and piston assemblies onto the pivot and pistons into the piston block assembly. (See Figure 51)

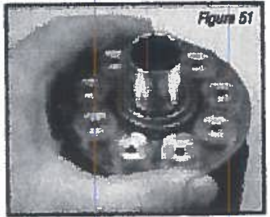


Figure 51

21 Hold the housing assembly in the vertical position then carefully install the rotating kit by first aligning with the splines on the input shaft. With splines aligned, install the rotating kit into the pump housing. (See Figure 52) Use caution to ensure all parts are kept in their proper position.

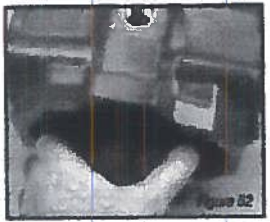


Figure 52

22 With the rotating kit installed, reposition the housing assembly in the input shaft down position and install a new housing gasket. (See Figure 53)

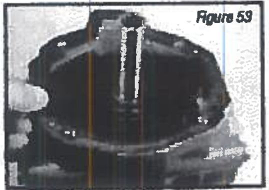


Figure 53

23 Lightly coat the backplate side of the valve plate with petroleum jelly for retention during assembly. Install the valve plate over the needle bearing, aligning the small slot on the outside of the valve plate with the dowel pin in the backplate. (See Figure 54)

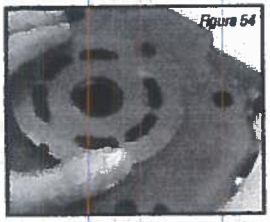


Figure 54

24 Carefully install the backplate assembly by aligning it with the dowel pins located in the pump housing. Use caution not to dislodge the valve plate. (See Figure 55)

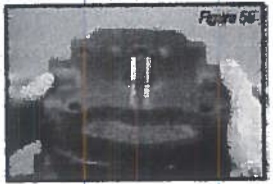


Figure 55

25 Lightly coat the charge pump assemblies drive key with petroleum jelly and install it in the drive shaft assembly. (See Figure 56)

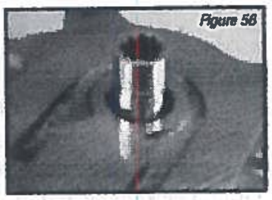


Figure 56

26 Align the keyway of the gerotor's inner ring, then lubricate and install the inner ring and outer ring over the input shaft and onto the backplate assembly. (See Figure 57)

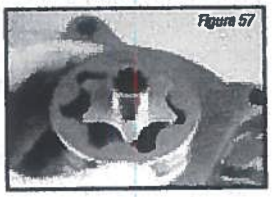


Figure 57

Note: Before installing the charge pum adaptor plate, offset the outer ring of the geroter as shown.

27 With the gerotor assembly installed, install new o-ring into charge pump adapter plate and place adapter onto backplate over gerotor. Retain with cap screws. Torque cap screws to 52,9 to 56 Nm [39 to 42 ft. lbs.]. (See Figure 58)

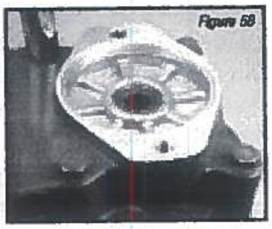


Figure 58

28 Install the two high pressure relief valves. Torque valves 128,8 to 142,4 Nm [95 to105 ft. lbs.]. (See Figure 59)

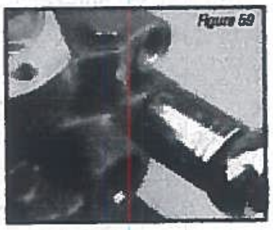


Figure 59

29 Lubricate and reassemble the bypass valve assembly. Install the bypass valve into the backplate. Torque valve to 36,6 to 40,6 Nm [27 to 30 ft. lbs.]. (See Figure 60)

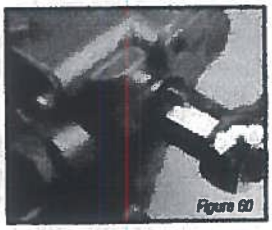


Figure 60

30 Coat the charge pressure poppet with petroleum jelly and place poppet onto spring and install into the adapter plate. (See Figure 61)

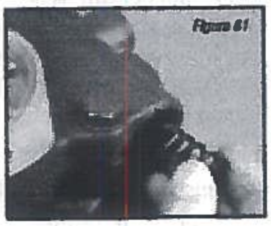


Figure 61

31 Install the hollow charge pressure relief valve retainer into the adapter plate. Torque retainer to 6,8 to 9,5 Nm [5 to 7 ft. lbs.].

32 Lubricate and install the o-ring on the cover plate or gear pump. Install the cover plate or gear pump and two cap screws. Torque cap screws to 36,6 to 40 Nm [27 to 31 ft. lbs.].

The Model 70360 or 78362 variable displacement pump is now ready for test and reinstallation.

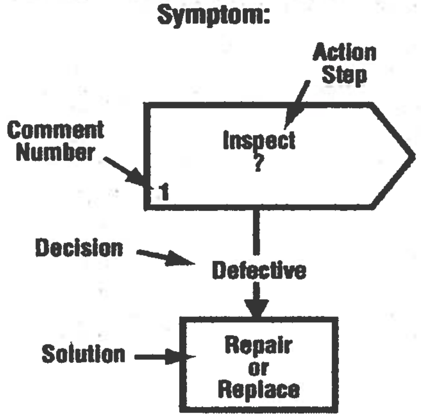
Fault - Logic Troubleshooting

This fault - logic Troubleshooting guide is a diagnostic aid in locating transmission problems.

Match the transmission symptoms with the problem statements and follow the action steps shown in the box diagrams. This will give help in correcting minor problems eliminating unnecessary machine down time.

Following the fault - logic diagrams are diagram action comments of the action steps shown in the diagrams. Where applicable, the comment number of the statement appears in the action block of the diagrams.

Explanatory Diagram



Recommended Gauge Locations

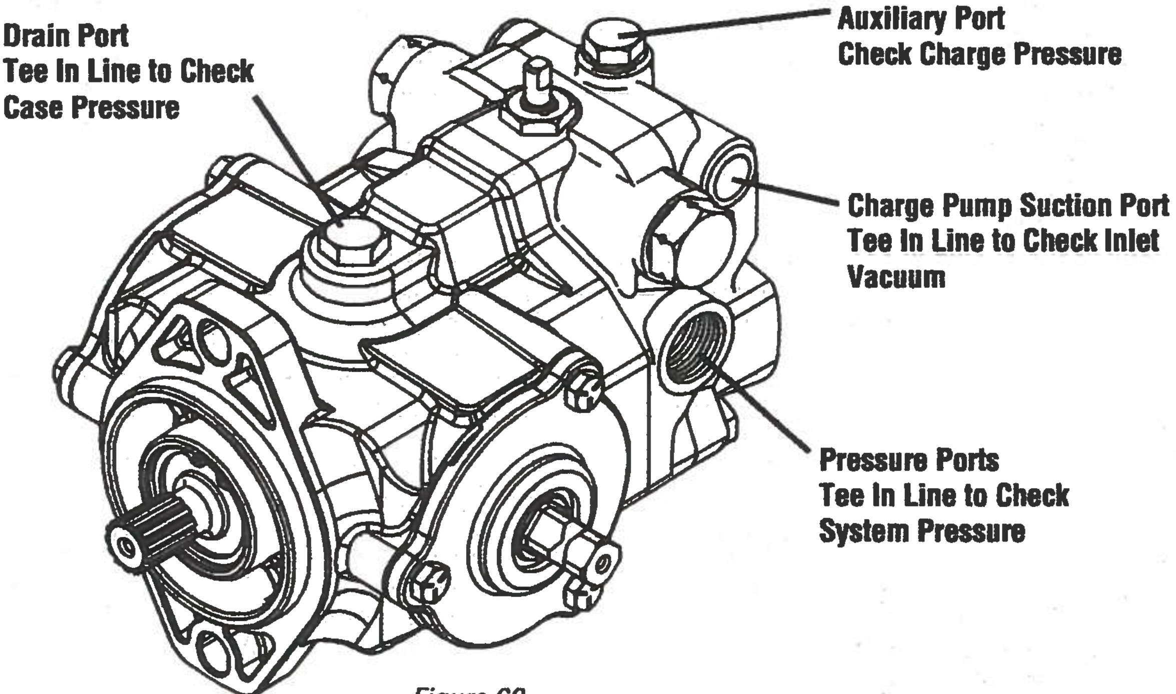


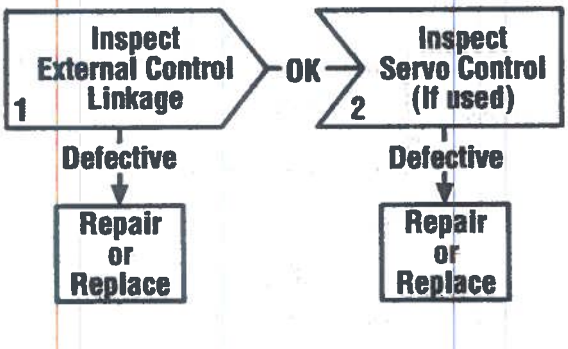
Figure 62

Gauges Recommended

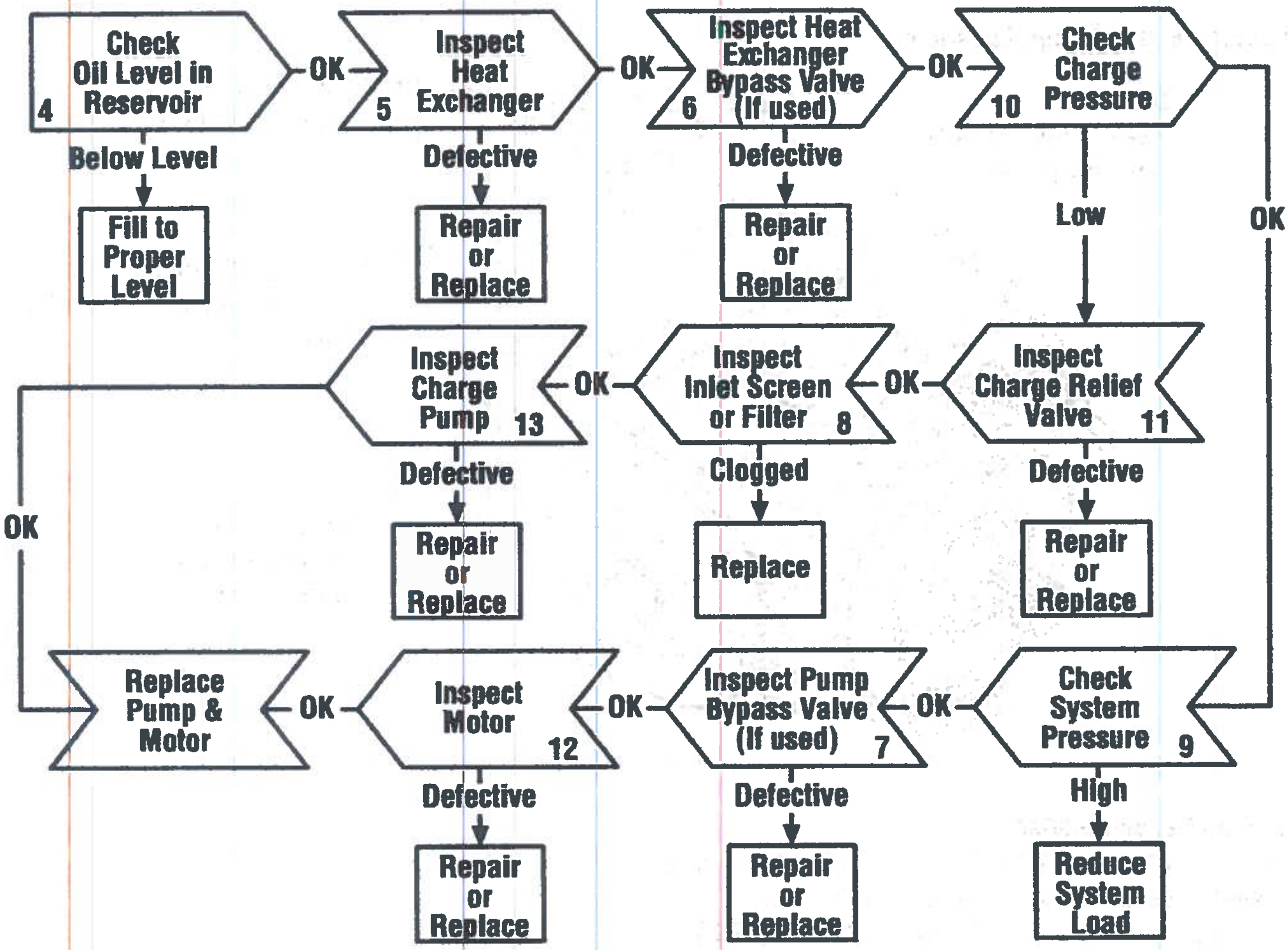
Inlet vacuum gauge: 2 bar to 1 bar [30 PSI to 30 inHg]
System pressure gauge: 700 bar [10,000 PSI]
Charge pressure gauge: 0 to 50 bar [0 to 600 PSI]
Case pressure gauge: 0 to 25 bar [0 to 300 PSI]

Fault - Logic Troubleshooting

Symptom: Neutral Difficult or Impossible to Find

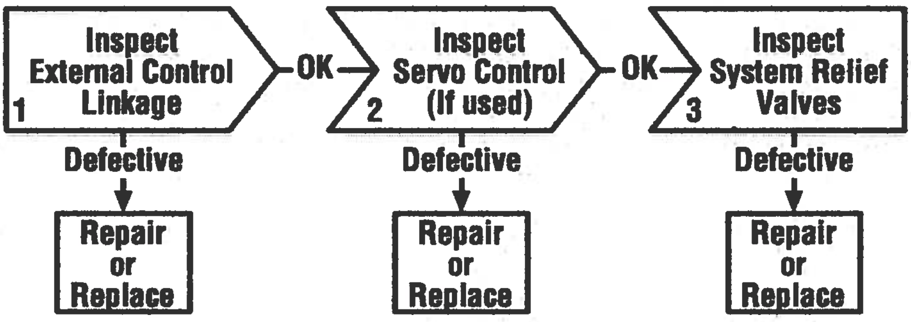

1 Inspect External Control Linkage
OK
2 Inspect Servo Control (If used)
Defective
Repair or Replace
Defective
Repair or Replace

Symptom: System Operating Hot

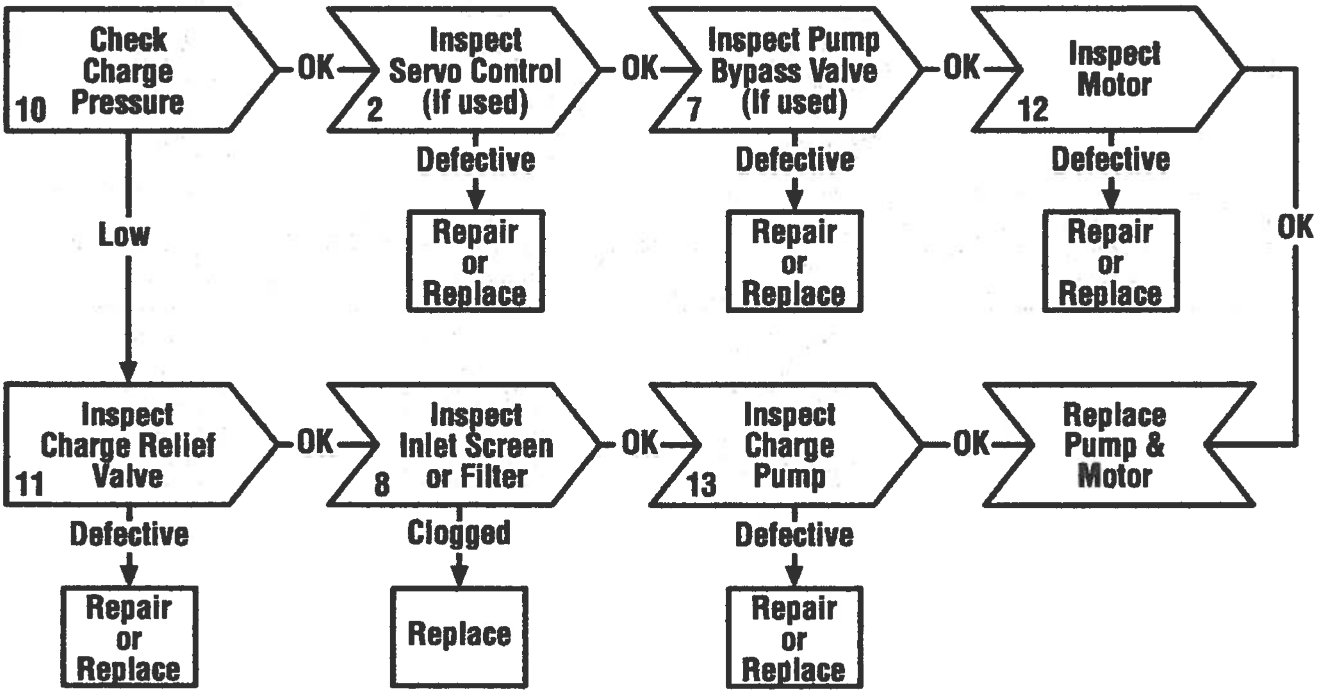


Fault - Logic Troubleshooting

Symptom: Operates in One Direction Only

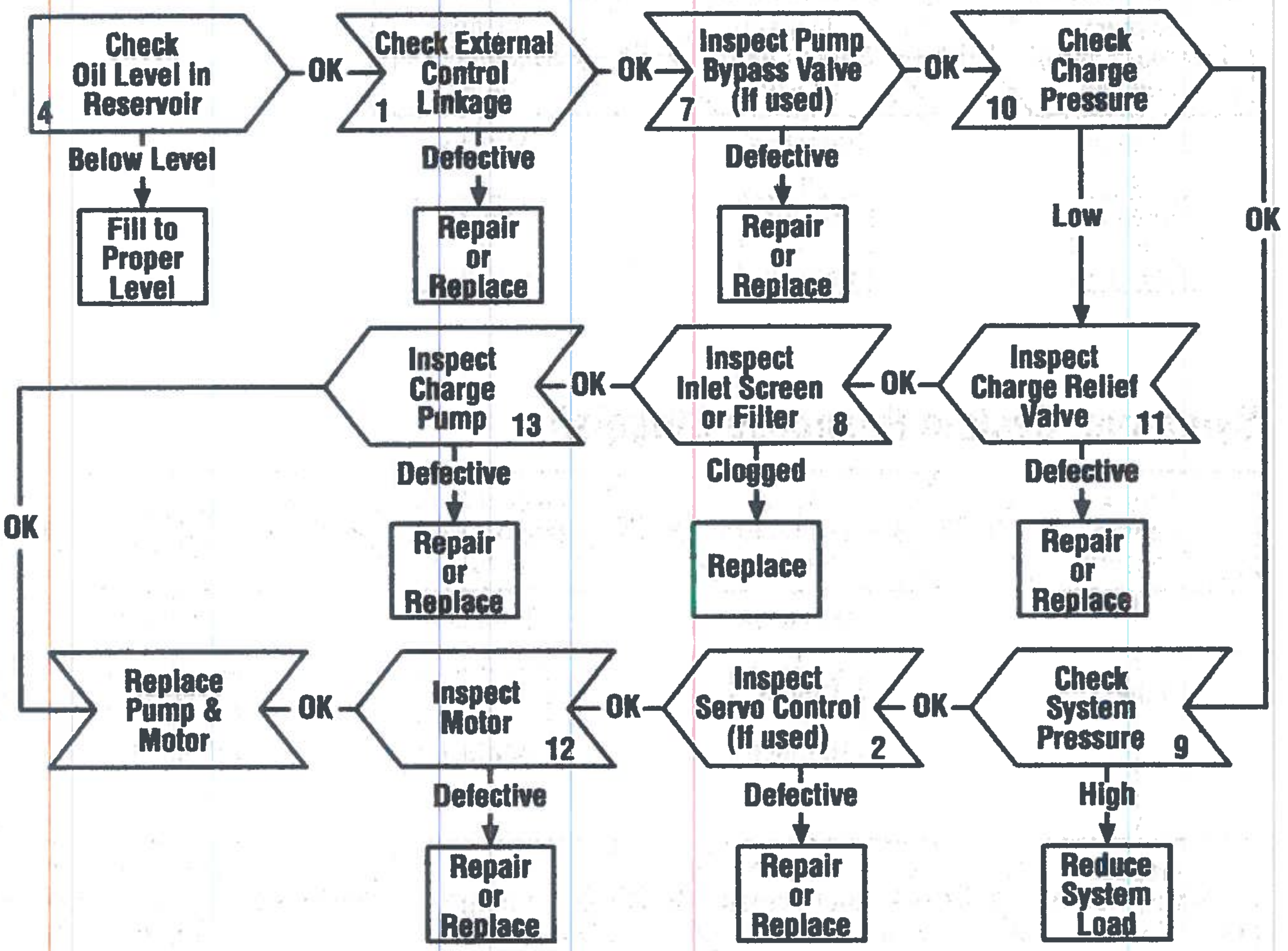

1 Inspect External Control Linkage
OK
2 Inspect Servo Control (If used)
OK
3 Inspect System Relief Valves
Defective
Repair or Replace
Defective
Repair or Replace
Defective
Repair or Replace

Symptom: System Response Sluggish



Fault - Logic Troubleshooting

Symptom: System Will Not Operate In Either Direction



Fault - Logic Troubleshooting

Diagram Action Step Comments

1 **Inspect External Control Linkage for:**
- a. misadjustment or disconnection
- b. binding, bending or breakage
- c. misadjusted, damaged or broken neutral return spring

2 **Inspect Servo Control Valve for: (if used)**
- a. proper inlet pressure
- b. misadjusted, damaged or broken neutral return spring
- c. galled or stuck control spool
- d. galled or stuck servo piston

3 **Inspect System Relief Valves* for:**
- a. improper pressure relief setting
- b. damaged or broken spring
- c. valve held off seat
- d. damaged valve seat

4 **Check Oil Level in Reservoir:**
- a. consult owner/operators manual for the proper type fluid and level

5 **Inspect Heat Exchanger for:**
- a. obstructed air flow (air cooled)
- b. obstructed water flow (water cooled)
- c. improper plumbing (inlet to outlet)
- d. obstructed fluid flow

6 **Inspect Heat Exchanger Bypass Valve for: (if used)**
- a. improper pressure adjustment
- b. stuck or broken valve

7 **Inspect Pump Bypass Valve for: (if used)**
- a. held in a partial or full open position

8 **Inspect Inlet Screen or Filter for:**
- a. plugged or clogged screen or filter element
- b. obstructed inlet or outlet
- c. open inlet to charge pump

9 **Check System Pressure:**
- a. See figure 3-1 for location of pressure gauge installation.
- b. consult owner/operators manual for maximum system relief valve settings

10 **Check Charge Pressure:**
- a. See figure 62 for location of pressure gauge installation.
- b. consult owner/operators manual for maximum charge relief valve settings

11 **Inspect Charge Relief Valve for:**
- a. improper charge relief pressure setting *
- b. damaged or broken spring
- c. poppet valve held off seat

12 **Inspect Motor for:**
- a. disconnected coupling

13 **Inspect Charge Pump for:**
- a. broken or missing drive key
- b. damaged or missing o-ring
- c. excessive gerotor clearance
- d. galled or broken gerotor set

* **System/Charge Relief Valve Pressure Settings for Eaton's Variable Displacement Controlled Piston Pumps**

Inlet Vacuum	6 inHg max.
Case Pressure	25 PSI maximum
Charge Pressure	100 to 150 PSI Standard 200 to 250 PSI Optional 250 to 300 PSI Optional
System Pressure	5000 PSI maximum 3000 PSI continuous

The high pressure relief valves are all factory preset and cannot be readjusted.

The pressure setting and assembly number is stamped on each high pressure relief valve cartridge.

Valve Identification Example:

32060-IA 5000

5000 — Relief Valve Setting

32060-IA — Relief Valve Assembly Number

Start-up Procedure

When initially starting a new or rebuilt transmission system, it is extremely important to follow the start-up procedure. It prevents the chance of damaging the unit which might occur if the system was not properly purged of air before start-up.

1 After the transmission components have been properly installed, fill the pump housing at least half full with filtered system oil. Connect all hydraulic lines and check to be sure they are tight.

2 Install and adjust all control linkage.

3 Fill the reservoir with an approved oil that has been filtered through a 10 micron filter. Refer to Eaton Hydraulics Technical Data sheet number 3-401 titled Hydraulic Fluid Recommendations.

4 Gasoline or L.P. engines: remove the coil wire and turn the engine over for 15 seconds. Diesel engines: shut off the fuel flow to the injectors and turn the engine over for 15 seconds.

5 Replace the coil wire or return the fuel flow to the injectors. Place the transmission unit in the neutral position, start the engine and run it at a low idle. The charge pump should immediately pick up oil and fill the system. If there is no indication of fill in 30 seconds, stop the engine and determine the cause.

6 After the system starts to show signs of fill, slowly move pump camplate to a slight cam angle. Continue to operate system slowly with no load on motors until system responds fully.

7 Check fluid level in the reservoir and refill if necessary to the proper level with an approved filtered oil.

8 Check all line connections for leaks and tighten if necessary.

The machine is now ready to be put into operation.

Frequent filter changes are recommended for the first two changes after placing the machine back into operation. Change the first filter in 3-5 hours and the second in approximately 50 hours. Routinely scheduled filter changes are recommended for maximum life of the hydraulic system.

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February 2003

Eaton®
Medium Duty Piston Pump

No. 06-639
December 1998

Parts Information

Model 70360 Variable Displacement Piston Pump

40,6 cm³/r [2.48 in³/r] or 49,2 cm³/r [3.00 in³/r] Displacements
Manual Controlled

-02

Identification Numbers - Manually Variable Displacement Piston Pump

Identification label on control arm side of housing.

A - Product Number Description
70360 = Single Piston Pump
78362 = Single Piston Pump with Gear Pump
78361 = Tandem Piston Pumps
78363 = Tandem Piston Pumps with Gear Pump
B - Sequential Numbering
C - Engineering Design Code

Single Pump - Product Number:

70360 - RAA - 02
A B C

Tandem Pumps - Product Number:

78363 - RAB - 02
A B C

Serial Number Code:

A 96 01 31 JB

Revision level of parts list. — A
Last two digits of year built. (91 for 1991 etc.) — 96
Month (two digits) — 01
Day of Month (two digits) — 31
Tester's Initials — JB

Each order must include the following information.

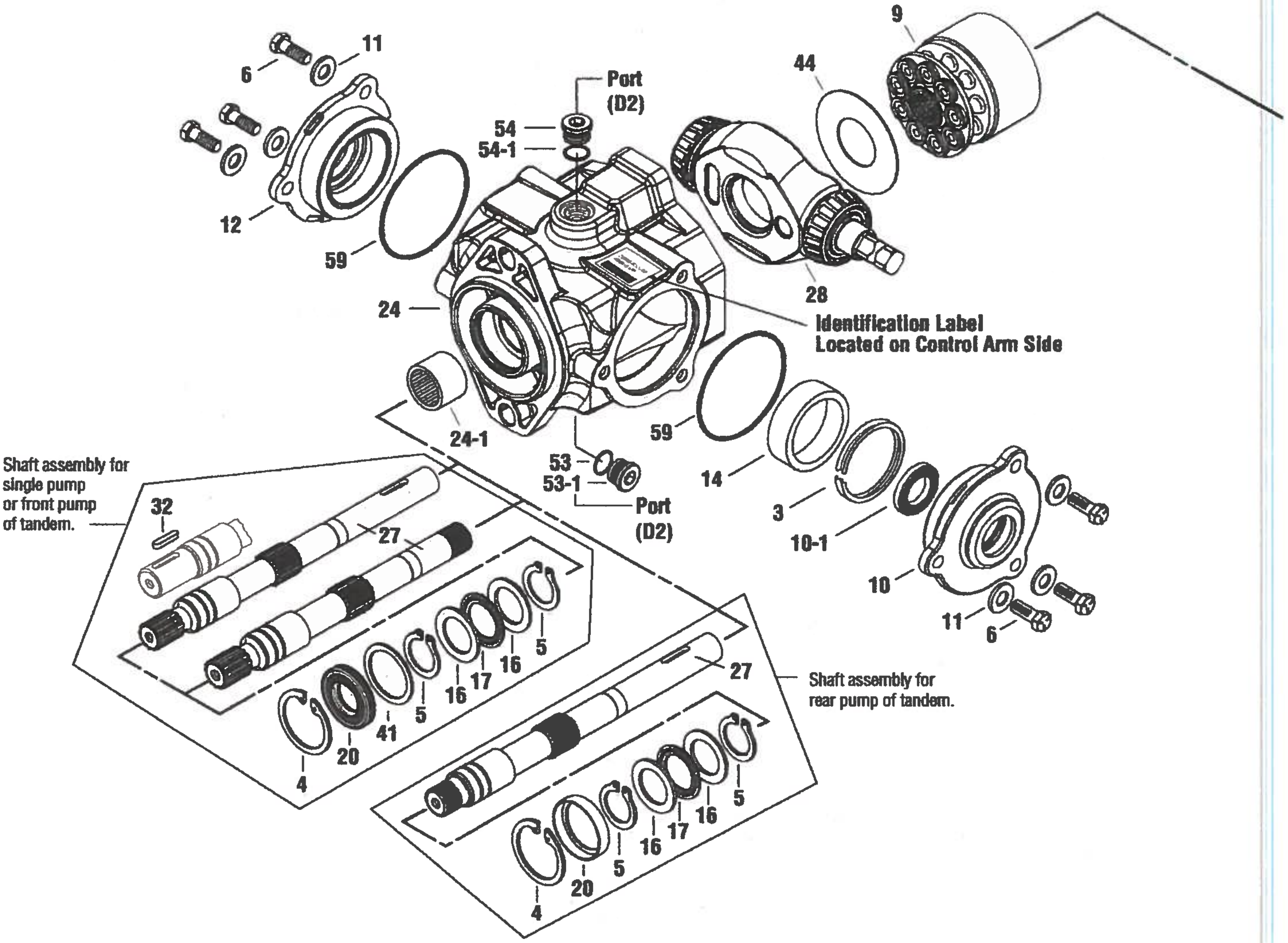
1. Product and/or Part Number
2. Serial Number Code
3. Part Name
4. Quantity

Tools Required

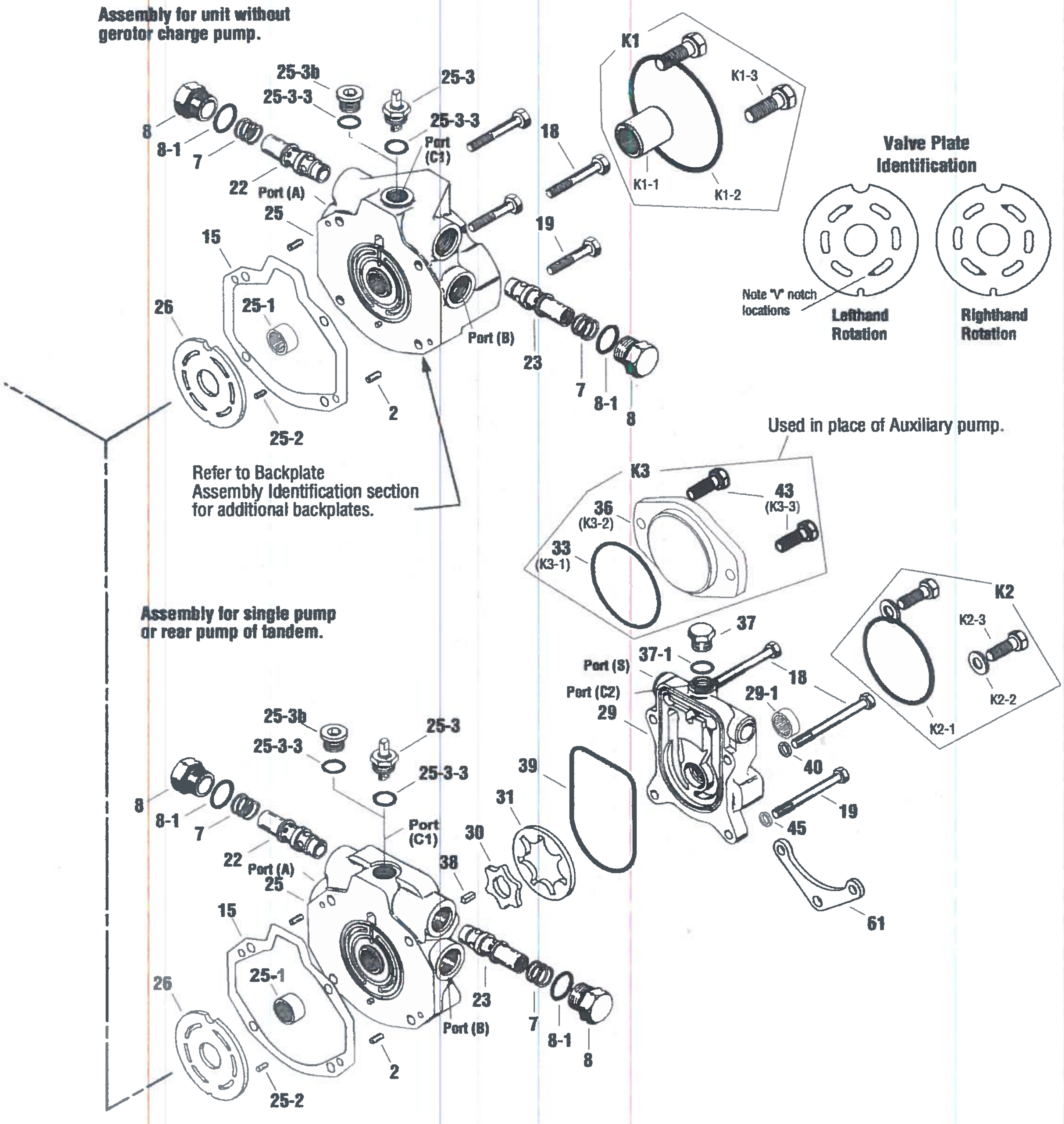
- 9/16, 7/8, 1-1/8 in. sockets and/or end wrenches
- Torque wrench (203 N·m [150 lbf·ft] capacity)
- Ratchet wrench
- 7/16 in. Allen wrench or bit socket
- Internal and external retaining ring pliers
- Small screwdrivers (2)
- Hammer (soft face)
- Light Petroleum Jelly
- Seal driver or similar tool

Parts Drawing

Pump drawn below is typical of a righthand rotation pump.


9
44
11
6
Port (D2)
54
54-1
12
59
28
24
Identification Label Located on Control Arm Side
24-1
59
14
53
53-1
Port (D2)
3
10-1
10
11
6
Shaft assembly for single pump or front pump of tandem.
32
27
27
5
16
17
16
41
5
20
4
27
Shaft assembly for rear pump of tandem.
5
16
17
16
5
20
4

Parts Drawing



Parts List

Item	Part No.	Qty.	Description
2	16028-404	2	Dowel Pin
3	70360-526	1	Crush Ring
+ 4	16077-32	1	Retaining Ring
+ 5	16078-18	2	Retaining Ring
6	16032-610	6	Screw
7	17079-2	2	Spring
8	32060-8	2	Plug Assembly
+ 8-1	16015-18-90	2	O-ring, 2,38 mm Dia. x 22,23 mm I.D. [.0937 in. Dia. x .875 in. I.D.]
9	◆	1	Rotating Kit Assembly (parts list on page #8)
10	70360-528	1	Cover Plate SA
+ 10-1	16253-16	1	Seal, Trunnion Shaft
11	16048-113	6	Washer
12	70360-520	1	Cover Plate SA
	16321-122	1	Bearing Cup
14	16321-122	1	Bearing Cup
+ 15	70412-626	1	Housing Gasket
16	74308-100	2	Thrust Race
17	74308-101	1	Needle Thrust Bearing
18	◆	2	Cap Screws (Locations on page #8)
	16032-622		3/8-16, 57,2 mm [2.25 in.] Long
	16040-640		3/8-16,101,6 mm [4.0 in.] Long
19	◆	2	Cap Screws (Locations on page #8)
	16032-616		3/8-16, 38,1 mm [1.5 in.] Long
	16032-620		3/8-16, 50,8 mm [2.0 in.] Long
	16032-632		3/8-16, 82,6 mm [3.25 in.] Long
+ 20	16253-18	1	Shaft Seal, Drive
20	16253-218	1	Shaft Seal, Drive (fluorocarbon rubber)
20	70400-620	1	Spacer (Used in rear pump of tandem in place of drive shaft seal.)
22	◆	1	Relief Valve for Port "A" (Identification drawing on page #9)
23	◆	1	Relief Valve for Port "B" (Identification drawing on page #9)
24		1	Housing Assembly
	70360-326	1	with drain port D1 and D2
	70360-330	1	with drain port D1, D2, and D3
24-1	16238-11816	1	Bearing (press fit)
25	◆	1	Backplate Assembly (Identification drawing and parts list on page #10 & #11)
26		1	Valve Plate (Identification drawing on page #5)
	70344-51		Righthand (CW) Rotation
	70344-52		Lefthand (CCW) Rotation
27	◆	1	Drive Shaft (Identification drawing on page #14)
28	70360-621	1	Camplate - Square End Trunnion
	16320-122	2	Bearing Cone
29	◆	1	Charge Pump Adaptor (Identification drawing and parts list on page #12 & #13)
30		1	Inner Gerotor
	79004-611		6,9 cm^3/r [.42 in^3/r] displacement, 6,35 mm [.25 in] width
	79004-605		13,8 cm^3/r [.84 in^3/r] displacement, 12,7 mm [.5 in] width
31		1	Outer Gerotor
	79004-612		6,9 cm^3/r [.42 in^3/r] displacement, 6,35 mm [.25 in] width
	79004-606		13,8 cm^3/r [.84 in^3/r] displacement, 12,7 mm [.5 in] width
32		1	Key, Drive Shaft
	16246-516		Used with 25,4 mm[1.00 in] dia. drive shaft.
	24500-619		Used with 22,2 mm [.875 in] dia. drive shaft.
+ 33	16007-14	1	O-ring (In K2 & K3 kit)
34	70411-613	1	Coupler
35	70411-605	1	Mounting Bracket
36	70142-600	1	Cover Plate (In K3 kit)

Parts List

	37	16103-108	1	Plug Assembly
+	37-1	16133-8	1	O-ring, 2,21 mm Dia. x 16,36 mm ID. [.087 in. Dia. x .644 in. ID.]
	38	15222-20	1	Key, Gerotor Pump Adapter
+	39	70342-600	1	Molded O-ring
	40	16048-113	2	Washer
	41	16048-319	1	Washer
	42	16246-523	1	Key, Camplate Trunnion
	43	16032-610	2	Cap Screws, Cover Plate (In K3 kit)
	44	70300-604	1	Insert, Camplate
	45	16048-113	6	Washer
	53	16103-308	1	Plug Assembly
+	53-1	16133-8	1	O-ring, 2,20 mm Dia. x 16,35 mm ID. [.087 in. Dia. x .644 in. ID.]
	54	16103-308	1	Plug Assembly
+	54-1	16133-8	1	O-ring, 2,20 mm Dia. x 16,35 mm ID. [.087 in. Dia. x .644 in. ID.]
+	59	16015-53	2	O-ring, 2,38 mm Dia. x 88,9 mm ID. [.0937 in. Dia. x 3.5 in. ID.]

Mounting Kits

	K1	70342-905	1	Tandem Piston Pump Mounting Kit
	K1-1	70411-622	1	41T Coupler, 33,02 mm [1.3 in.] long
+	K1-2	16007-17	1	O-ring, 1,59 mm Dia. x 101,6 mm ID. [.0625 in. Dia. x 4 in. ID.]
	K1-3	16032-812	2	Cap Screws
	K2	70442-929	1	Gear Pump Mounting Kit
+	K2-1	16007-14	1	O-ring, 1,59 mm Dia. x 82,55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
	K2-2	16048-113	1	Washer
	K2-3	16032-610	2	Cap Screws
	K3	70142-915	1	Cover Plate Kit
+	K3-1	16007-14	1	O-ring, 1,59 mm Dia. x 82,55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
	K3-2	70142-600	1	Cover Plate
	K3-3	16032-610	2	Cap Screws

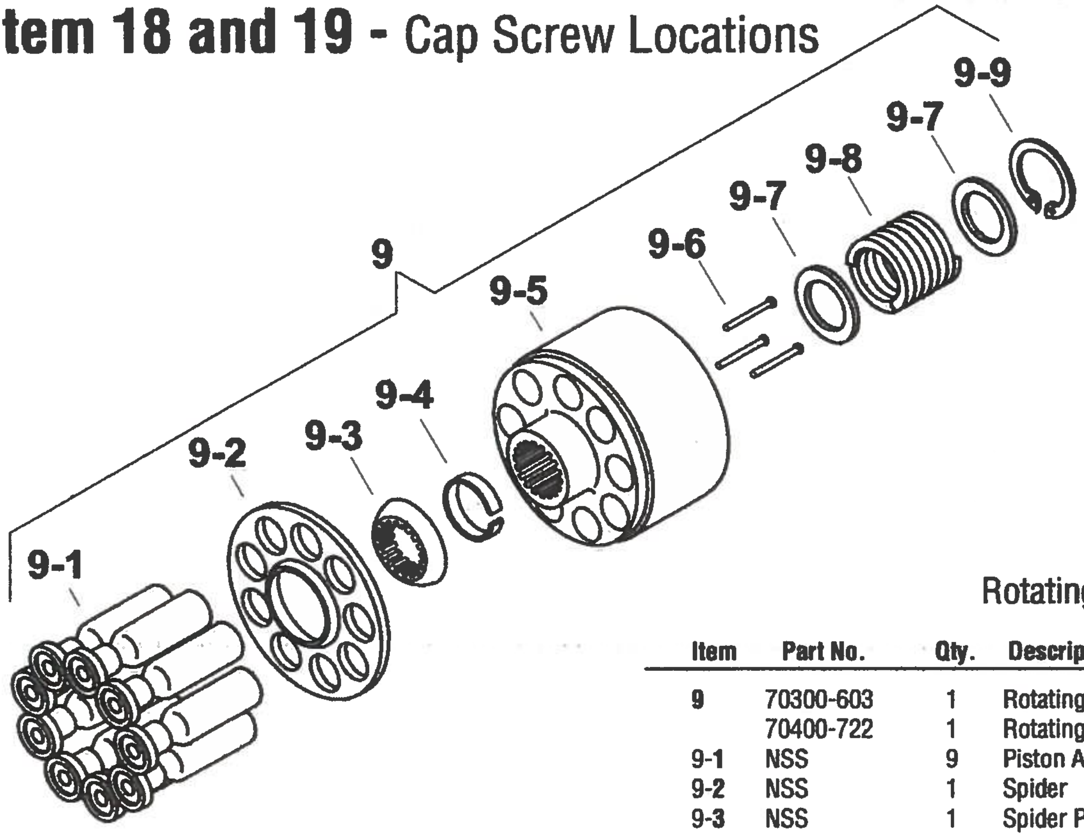
Seal Repair Kits

•	70360-900	1	Seal Repair Kit for 70360 piston pump (order two for tandem pumps).
•	70360-901	1	Control Shaft Bearing Shim Kit (to replace crush ring after replacement of major part).

Legend

◆	Refer to specific item parts list.
+	Common parts to seal repair kits.

Item 9 - Rotating Kit Assembly
Item 18 and 19 - Cap Screw Locations

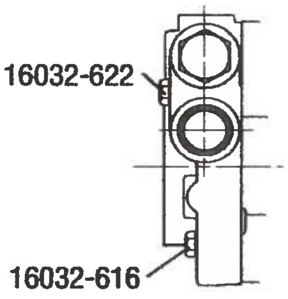


Item 9
Rotating Kit Assembly

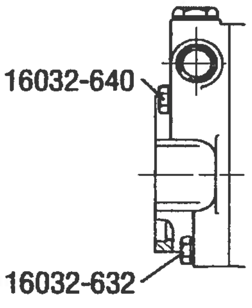
Item	Part No.	Qty.	Description
9	70300-603	1	Rotating Kit Assy. 2.48 in^3/r
	70400-722	1	Rotating Kit Assy. 3.00 in^3/r
9-1	NSS	9	Piston Assembly
9-2	NSS	1	Spider
9-3	NSS	1	Spider Pivot
9-4	NSS	1	Retainer
9-5	NSS	1	Piston Block
9-6	NSS	3	Pins
9-7	NSS	2	Washer
9-8	NSS	1	Spring
9-9	NSS	1	Retaining Ring

NSS - Not Sold Separately

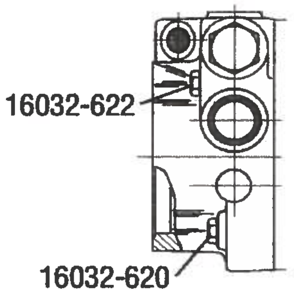
Item 18 and 19
Cap Screw Locations



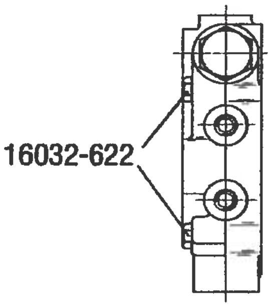
Rear "A" Flange, without Gerotor, Opposite Side Porting



Rear "A" Flange, with Gerotor, Opposite Side Porting



Rear "B" Flange, without Gerotor, Opposite Side Porting



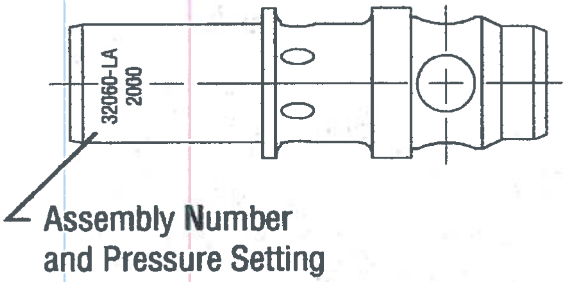
Rear "A" Flange, without Gerotor, Same Side Porting

Item 22 or 23 - Relief Valve

Item 22 or 23

Internal Relief Valve Settings Available

Part Number	bar [PSI]
32060-LA	138 [2000]
32060-QA	172 [2500]
32060-UA	207 [3000]
32060-WA	241 [3500]
32060-ZA	276 [4000]
32060-XA	310 [4500]
32060-IA	345 [5000]
70111-518	Seat, Valve



Item 25 -

Backplate Assembly Identification

Item 25 - Parts List (Refer to Identification chart and drawings)

	Item	Part No.	Qty.	Description
	25	See Chart Below		Backplate Assembly
	25-1	52200-23	1	Bearing
	25-2	16026-610	1	Dowel Pin
	25-3	70300-610	1	Bypass Valve Assembly
	25-3-1	16078-6	1	Retaining Ring
	25-3-2	70300-609	1	Separator Plug
+	**25-3-3**	16133-8	1	O-ring, 2,38 mm Dia. x 16,27 mm I.D. [.0937 in. Dia. x .6406 in. I.D.]
	25-3-4	70411-502	1	Speader
+	**25-3-5**	16003-7	1	O-ring, 1,59 mm Dia. x 9,53 mm I.D. [.0625 in. Dia. x .375 in. I.D.
	25-3a	16103-108	1	Plug Assembly, Hex
+	**25-3-3**	16133-8	1	O-ring, 2,38 mm Dia. x 16,27 mm I.D. [.0937 in. Dia. x .6406 in. I.D.]
	25-3b	16103-308	1	Plug Assembly, Internal Hex Socket
+	**25-3-3**	16133-8	1	O-ring, 2,38 mm Dia. x 16,27 mm I.D. [.0937 in. Dia. x .6406 in. I.D.]

Legend + Common parts to seal repair kits listed.

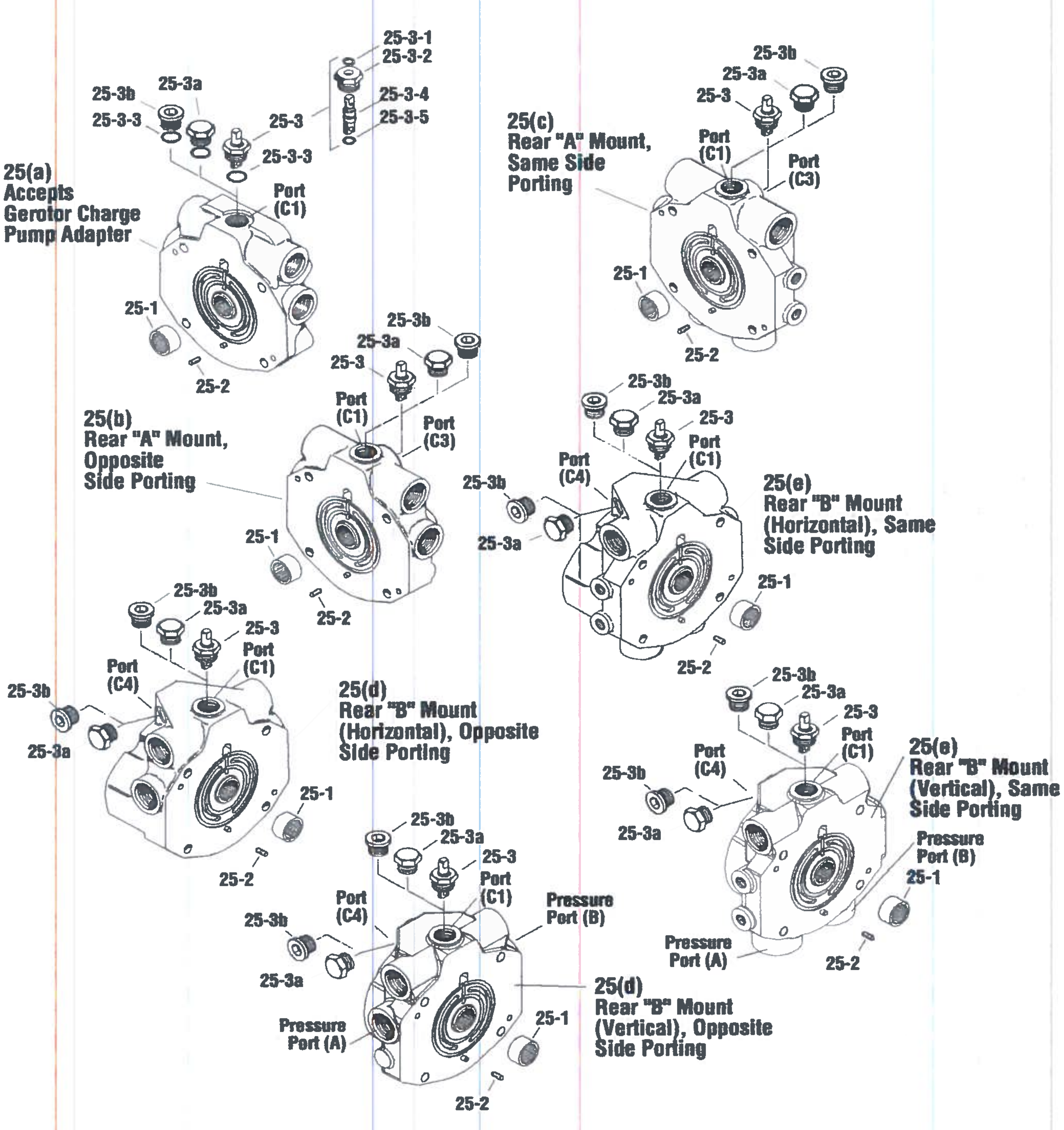
Item 25

Backplate Assembly Identification (Refer to drawings on page #11)

Description	Assembly Part Number	Aux. Port Machined	C1 Aux. Port Plug	C3 Aux. Port Plug	C1 Aux. Port Bypass Valve	C3 Aux. Port Bypass Valve	C4 Aux. Port Plug
25(a) - Accepts Gerotor Charge Pump	70300-413	C1	Item 25-3a				
	70300-426	C1			Item 25-3		
25(b) - Rear "A" Mount, Opposite Side Porting	70300-409	C1					
	70300-415	C1, C3				Item 25-3	
25(c) - Rear "A" Mount, Same Side Porting	70300-403	C1, C3	Item 25-3a				
	70300-421	C1, C3		Item 25-3b			
	70300-437	C1, C3	Item 25-3b				
25(d) - Rear "B" Mount, Opposite Side Porting							
Horizontal	70300-407	C1					
	70300-411	C1, C4			Item 25-3		
	70300-439	C1, C4	Item 25-3a				
Vertical	70360-413	C1, C4	Item 25-3a				
25(e) - Rear "B" Mount, Same Side Porting							
Horizontal	70300-401	C1, C4	Item 25-3a				
	70300-418	C1, C4					Item 25-3a
Vertical	70360-411	C1, C4	Item 25-3a				

Item 25 -

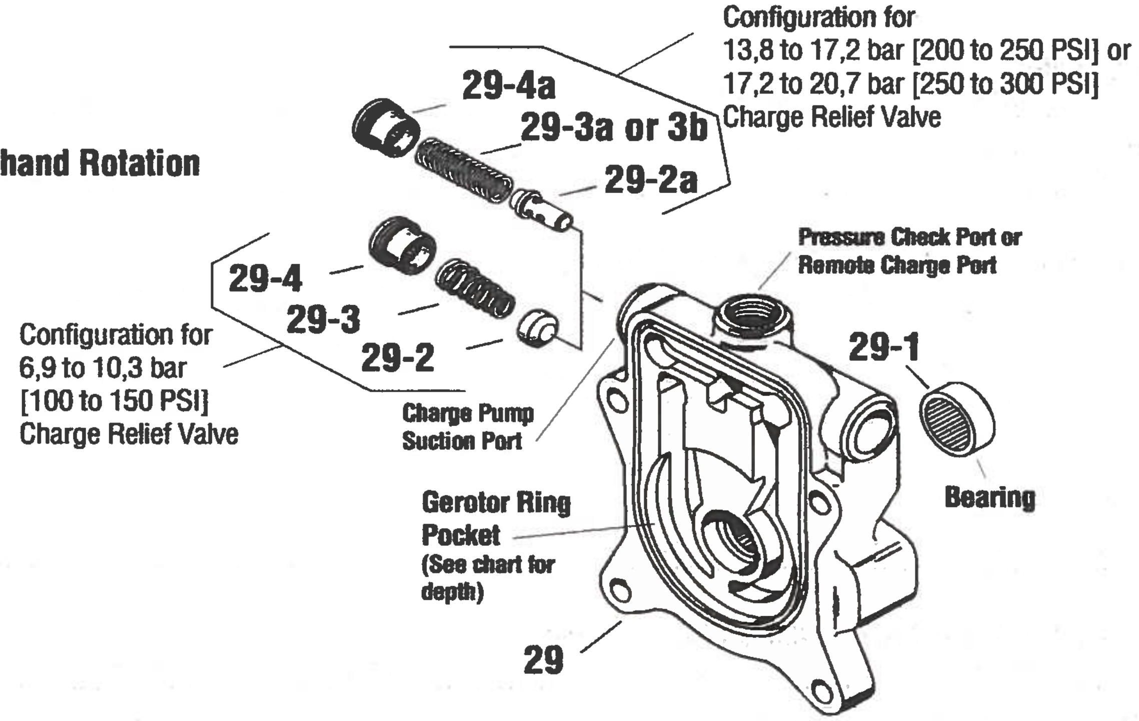
Backplate Assembly Identification



Item 29 -

Charge Pump Adapter Assembly Identification

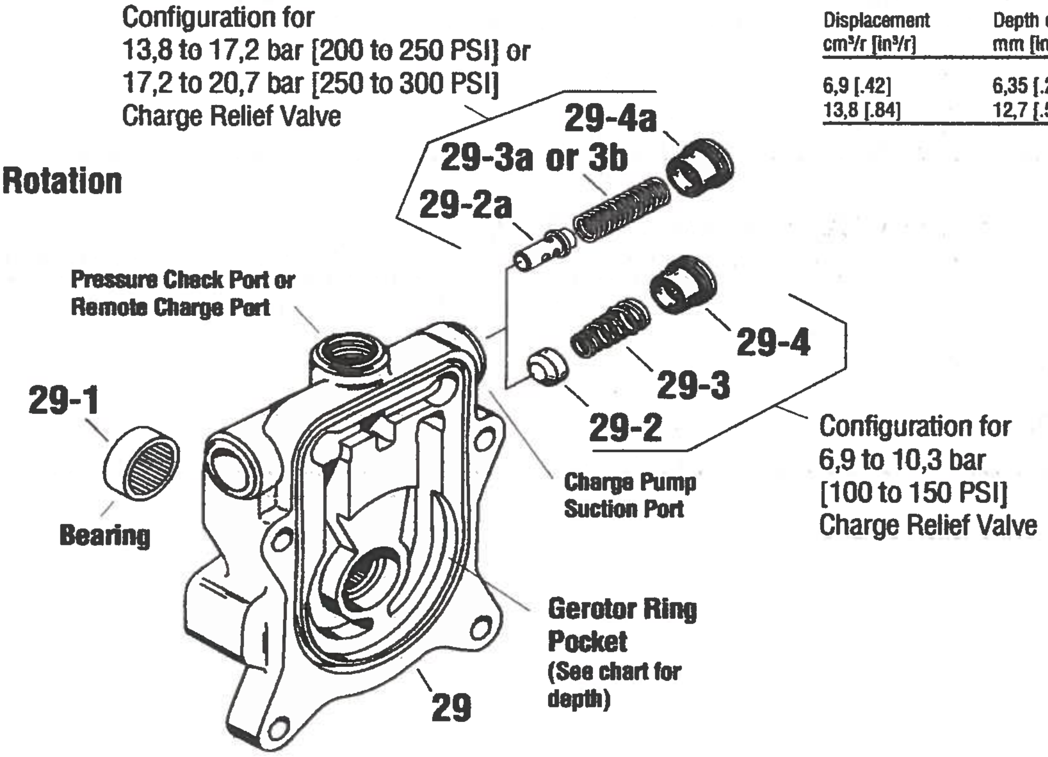
Righthand Rotation



Gerotor Pocket Depth

Displacement cm³/r [in³/r]	Depth of Pocket mm [in.]
6,9 [.42]	6,35 [.25]
13,8 [.84]	12,7 [.50]

Lefthand Rotation



Item 29 -
Charge Pump Adapter Assembly

No Charge Relief

Item	Part No.	Qty.	Description	Rotation	Displacement
29	70440-369	1	Assembly, Charge Pump Adapter	Righthand	13,8 cm³/r [.84 in³/r]
29-1	16239-1148	1	Bearing (press fit)		

6.9 to 10.3 bar [100 to 150 PSI] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
29	70442-356	1	Assembly, Charge Pump Adapter	Righthand	6,88 cm³/r [.42 in³/r]
	70442-368	1	Assembly, Charge Pump Adapter	Lefthand	13,8 cm³/r [.84 in³/r]
	70442-374	1	Assembly, Charge Pump Adapter	Righthand	13,8 cm³/r [.84 in³/r]
	70442-389	1	Assembly, Charge Pump Adapter	Lefthand	6,88 cm³/r [.42 in³/r]
29-1	16239-1148	1	Bearing (press fit)		
29-2	70111-507	1	Poppet, Cup		
29-3	17000-48B	1	Spring, Tapered		
29-4	70400-505	1	Spring Retainer		

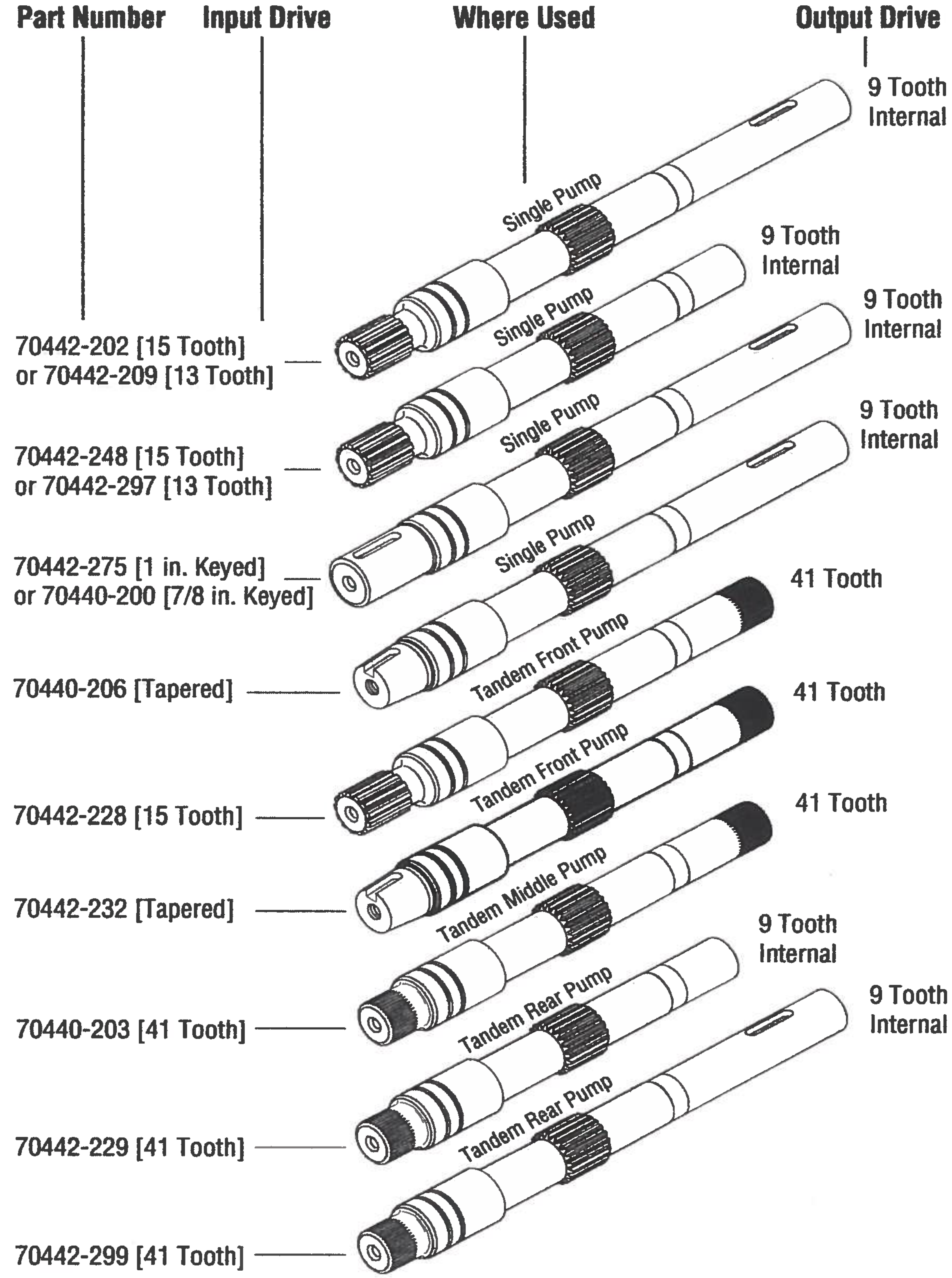
13.8 to 17.2 bar [200 to 250 PSI] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
29	70440-388	1	Assembly, Charge Pump Adapter	Lefthand	6,88 cm³/r [.42 in³/r]
	70440-389	1	Assembly, Charge Pump Adapter	Righthand	6,88 cm³/r [.42 in³/r]
	70440-385	1	Assembly, Charge Pump Adapter	Righthand	13,8 cm³/r [.84 in³/r]
29-1	16239-1148	1	Bearing (press fit)		
29-2a	70400-727	1	Poppet, Pin		
29-3a	17056-40	1	Spring, Color "Light Green"		
29-4a	70400-512	1	Spring Retainer		

17.2 to 20.7 bar [250 to 300 PSI] Charge Relief Setting

Item	Part No.	Qty.	Description	Rotation	Displacement
29	70440-381	1	Assembly, Charge Pump Adapter	Righthand	6,88 cm³/r [.42 in³/r]
	70440-390	1	Assembly, Charge Pump Adapter	Righthand	13,8 cm³/r [.84 in³/r]
29-1	16239-1148	1	Bearing (press fit)		
29-2a	70400-727	1	Poppet, Pin		
29-3b	17056-41	1	Spring, Color "Pink"		
29-4a	70400-512	1	Spring Retainer		

Item 27 - Drive Shaft Identification



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December 1998

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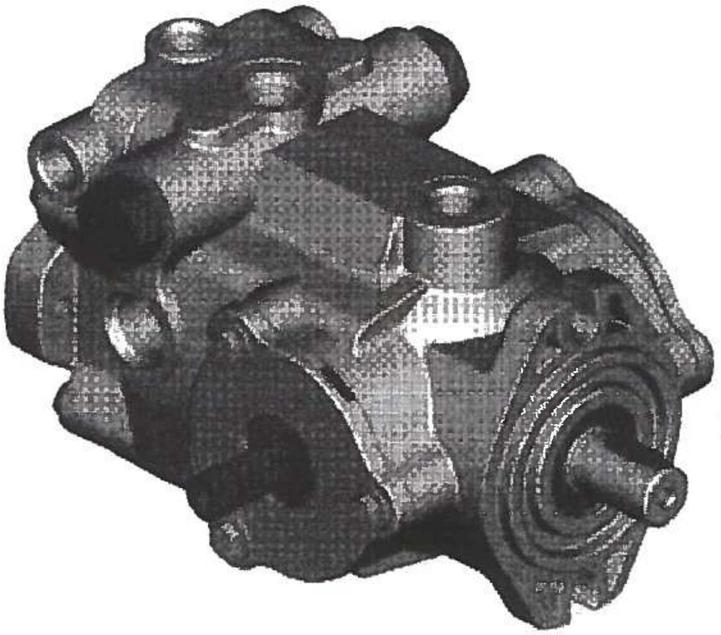
Medium Duty Piston Pump

Model 70160 Variable Displacement Piston Pump

20,3 cm^3/r [1.24 in^3/r] or 23,6 cm^3/r [1.44 in^3/r] Displacements

Manual Controlled - 02



Introduction

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Introduction

This manual provides service information for Eaton Models 70160 variable displacement piston pumps. Step by step instructions for the complete disassembly, inspection, and reassembly of the pump are given. The following recommendations should be followed to insure successful repairs.

- Remove the pump from the application.
- Cleanliness is extremely important.
- Clean the port areas thoroughly before disconnecting the hydraulic lines.
- Plug the pump ports and cover the open hydraulic lines immediately after they're disconnected.
- Drain the oil and clean the exterior of the pump before making repairs.
- Wash all metal parts in clean solvent.
- Use compressed air to dry the parts. Do not wipe them dry with paper towels or cloth.
- Compressed air should be filtered and moisture free.
- Always use new seals when reassembling hydraulic pumps.
- Lubricate the new rubber seals with a petroleum jelly (Vaseline®) before installation.
- Torque all bolts over gasketed joints, then repeat the torquing sequence to makeup for gasket compression.
- Verifying the accuracy of pump repairs on an authorized test stand is essential.

Identification Numbers - Manually Variable Displacement Piston Pump

Stamped on each unit's mounting flange.

A - Product Number Description
70160 = Single Piston Pump
78162 = Single Piston Pump with Gear Pump
78161 = Tandem Piston Pumps
78163 = Tandem Piston Pumps with Gear Pump
B - Sequential Numbering
C - Engineering Design Code

Single Pump - Product Number:

70160 - RAA - 02
A B C

Tandem Pumps - Product Number:

78163 - RAB - 02
A B C

Serial Number Code:

A 99 01 31 JB

Revision level of parts list. — A
Last two digits of year built. (98 for 1998 etc.) — 99
Month (two digits) — 01
Day of Month (two digits) — 31
Tester's Initials — JB

Each order must include the following information.

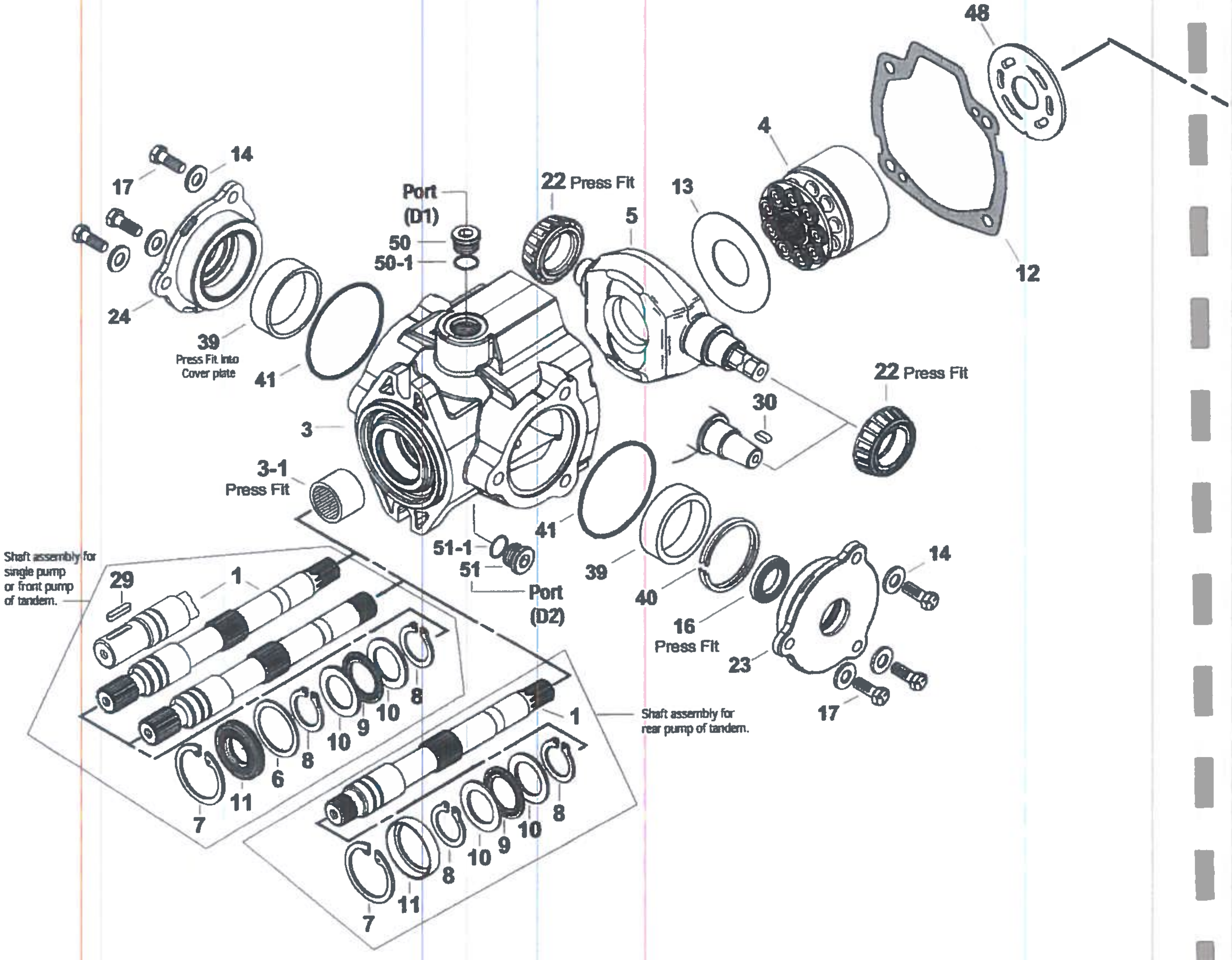
1. Product and/or Part Number
2. Serial Number Code
3. Part Name
4. Quantity

Tools Required

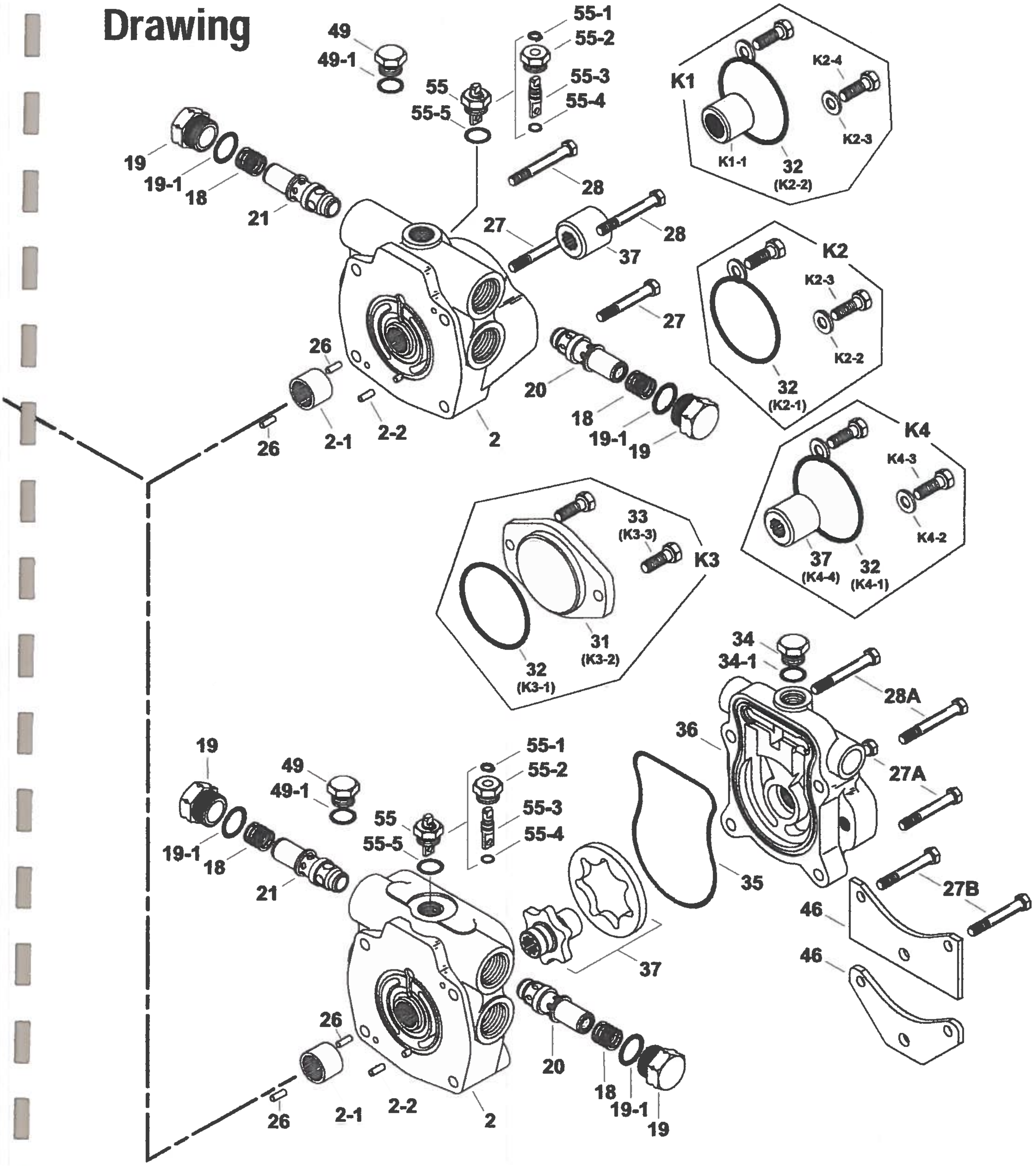
- 1/2, 9/16, 7/8 & 1-1/8 in. sockets and/or end wrenches
- Torque wrench (136 N·m [100 lbf·ft] capacity)
- Ratchet wrench
- 5/16 in. and 7/16 Allen wrenches or bit sockets
- Internal and external retaining ring pliers
- Small screwdrivers (2)
- Hammer (soft face)
- Light Petroleum Jelly
- Seal driver or similar tool

Parts Drawing

Pump drawn below is typical of a righthand rotation pump.



Parts Drawing



Parts List

	Item	Qty.	Description
	1	1	Drive Shaft
	2	1	Endcover Assembly
	3	1	Housing Assembly
	4	1	Rotating Kit Assembly
	5	1	Swashplate
	6	1	Washer
+	7	1	Retaining Ring
+	8	2	Retaining Ring
	9	1	Thrust Bearing
	10	2	Bearing Race
+	11	1	Shaft Seal, Drive
	11	1	Viton Shaft Seal, Drive
	11	1	Spacer
+	12	1	Housing Gasket
	13	1	Swashplate Insert
	14	6	Washer
+	16	1	Shaft Seal, Trunnion
	17	6	Screw, Cap
	18	2	Spring
	19	2	Plug Assembly
+	19-1	2	O-ring, 2.38 mm Dia. x 22.23 mm ID. [.0937 in. Dia. x .875 in. ID.]
	20	1	Relief Valve for Port "C"
	21	1	Relief Valve for Port "D"
	22	2	Cone Bearing
	23	1	Coverplate Sub Assembly
	24	1	Coverplate Sub Assembly
	26	2	Dowel Pin
	27	2	Cap Screws, 5/16-18, 50.8 mm [2 in.] Long
	27A	2	Cap Screws, 5/16-18, 82.6 mm [3.25 in.] Long
	27B	2	Cap Screws, 5/16-18, 88.9 mm [3.5 in.] Long
	28	2	Cap Screws, 5/16-18, 63.5 mm [2.5 in.] Long
	28A	2	Cap Screws, 5/16-18, 95.3 mm [3.75 in.] Long
	28B	2	Cap Screws, 5/16-18, 101.6 mm [4.00 in.] Long
	29	1	Key, Drive Shaft
	30	1	Key, Tapered Arm
	31	1	Cover Plate (In K3 kit)
+	32	1	O-ring (In K1, K2, K3, & K4 kit)
	33	2	Cap Screws, Cover Plate (In K3 kit)
	34	1	Plug Assembly
+	34-1	1	O-ring, 2.21 mm Dia. x 16.36 mm ID. [.087 in. Dia. x .644 in. ID.]
+	35	1	Molded O-ring
	36	1	Charge Pump Adaptor
	37	1	Gerotor set and coupler sub-assembly
	37	1	9 tooth coupler (In Kit 4)
	37	1	11 tooth coupler (In Kit 5)
	39	2	Cup, Bearing
	40	1	Ring, Crush
	41	2	O-ring, 2.38 mm Dia. x 66.68 mm I.D. [.0937 in. Dia. x 2.625 in. I.D.]
	42	4	Washer
	46	1	Mounting Bracket, Square shaped
	46	1	Mounting Bracket, "V" shaped

Parts List

	Item	Qty.	Description
	48	1	Valve Plate
			Righthand (CW) Rotation
			Lefthand (CCW) Rotation
	49	1	Plug Assembly
	49-1	1	Plug Assembly
+	50-1	1	O-ring, 1.98 mm Dia. x 11.89 mm ID. [.078 in. Dia. x .468 in. ID.]
	51	1	Plug Assembly
+	51-1	1	O-ring, 1.98 mm Dia. x 11.89 mm ID. [.078 in. Dia. x .468 in. ID.]
	55	1	Bypass Valve sub-assembly
+	55-1	1	Retaining Ring
	55-2	1	Separator Plug
	55-3	1	Separator
+	55-4	1	O-ring, 1.59 mm Dia. x 9.53 mm I.D. [.0625 in. Dia. x .375 in. I.D.]
+	55-5	1	O-ring, 2.46 mm Dia. x 19.18 mm I.D. [.097 in. Dia. x .755 in. I.D.]

Mounting Kits

Item	Qty.	Description
K1	1	Tandem Piston Pump Mounting Kit
K1-1	1	35T Coupler, 36.8 mm [1.45 in.] long
K1-2	1	O-ring, 1.59 mm Dia. x 101.6 mm ID. [.0625 in. Dia. x 4 in. ID.]
K1-3	2	Cap Screws
K1-4	2	Washer
K2	1	Gear Pump Mounting Kit
K2-1	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K2-2	2	Washer
K2-3	2	Cap Screws
K3	1	Cover Plate Kit
K3-1	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K3-2	1	Cover Plate
K3-3	2	Cap Screws
K4	1	Gear Pump Mounting Kit with Coupler
K4-1	1	O-ring, 1.59 mm Dia. x 101.6 mm ID. [.0625 in. Dia. x 4 in. ID.]
K4-2	2	Washer
K4-3	2	Cap Screws
K4-4	1	9T Coupler

Seal Repair Kit

Item	Qty.	Description
•	1	Seal Repair Kit (see Parts Manual for part numbers)

Legend + Included in seal repair kit.

Repair Information - Disassembly

Disassembly

The following disassembly procedure applies to a single pump with or without gear pump The repair procedure for tandem pumps, once they are separated, is basically the same. The basic configuration differences between a single and tandem pumps are the endcovers, pump shafts and housing assemblies. In most cases, only the rear pump of tandem units contain a charge pump, which is common to both the front and rear pump. The rear tandem pump does not incorporate a shaft seal.

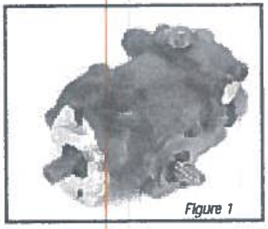


Figure 1

Thoroughly clean the Eaton Model 70160 or 78162 variable displacement pump before any repairs are attempted. When working on tandem pumps, separate the front and rear pumps first.

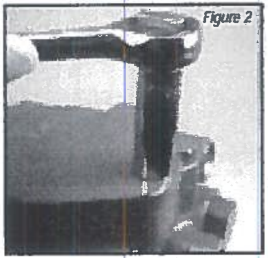


Figure 2

1 Support the pump with the input shaft down. Use a 1/2 in. socket or end wrench to remove the pump adapter cover plate or gear pump (see Figure 2).

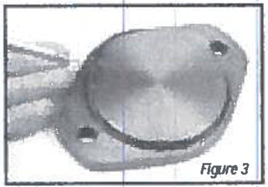


Figure 3

2 Use a pick or similar tool to remove the adapter cover plate or gear pump o-ring. (See Figure 3)

3 Use a 7/16 in. Allen wrench or bit socket remover to remove the charge pressure relief valve spring retainer from the pump adaptor assembly (see Figure 4).

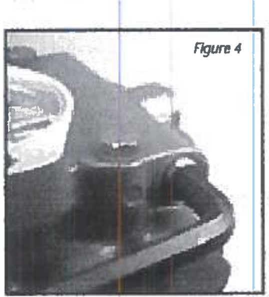


Figure 4

4 Use a pencil magnet or similar tool to carefully remove the charge pressure spring and poppet from the pump adaptor assembly. (See Figure 5) Use caution not to drop the charge pump poppet into the pump adaptor assembly.

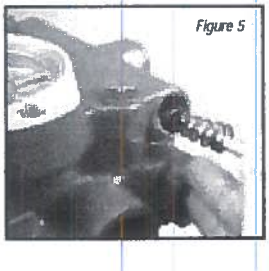


Figure 5

5 The charge pressure relief valve and poppet may be of the standard or high pressure type. The (6.9 to 10.3 bar [100 to 150 PSI]) standard spring and poppet are shown on the bottom and the optional high pressure (13.7 to 20.7 bar [200 to 300 PSI]) spring and poppet is shown on the top.

The same charge pressure relief valve spring retainer is used with either the standard or high pressure (see Figure 6).

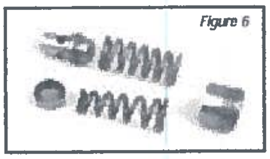


Figure 6

6 Use a 7/8 in. socket or end wrench to remove the optional bypass valve assembly from the endcover (see Figure 7).

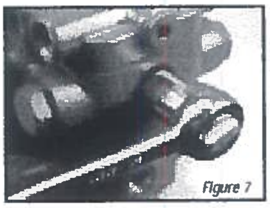


Figure 7

7 The internal seal may be replaced by first removing the small retaining ring on the end of the bypass valve. Remove and replace the o-rings (see Figure 8).

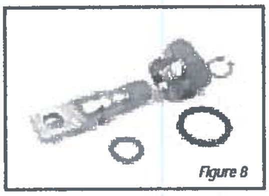


Figure 8

8 Use a 1-1/8 in. socket or end wrench to remove the two high pressure relief valves from the pumps endcover assembly (see Figure 9). Remove plug, spring, and relief valve as shown from each side (see Figure 10). Each system relief valve assembly is identified by both its part number and relief valve setting as shown in Parts Information manual.

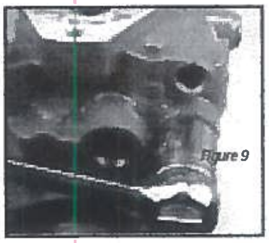


Figure 9

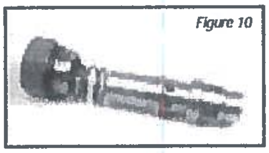


Figure 10

9 Firmly support the pump assembly. Use a 1/2 in. socket or end wrench to remove the four cap screws retaining the charge pump adapter assembly.

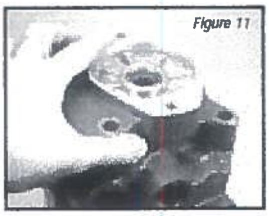


Figure 11

10 With the cap screws removed, remove the charge pump adaptor assembly from the endcover (see Figure 11).

Note: The front pump assemblies do not have charge pump adapter assemblies.

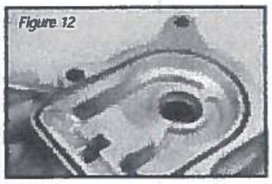


Figure 12

11 Turn the adapter assembly over. Use an o-ring pick or similar tool remove the o-ring seal (see Figure 12).

12 Inspect the gerotor pocket and needle bearing located in the charge pump adapter. The needles in the needle bearing must remain intact in the bearing cage.

Repair Information - Disassembly

13 When the needle bearing assembly is replaced, the numbered end of the bearing must face toward the flange side of the adapter to the dimension as shown (see Figure 13).

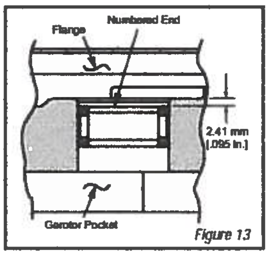


Figure 13

14 With the charge pump adapter removed, remove the charge pump outerring and inner gerotor ring assembly (see Figure 14 and 15).

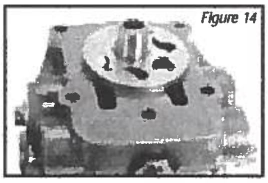


Figure 14

15 Charge pumps are available in two different displacements Charge pump displacements are based on the thickness of the gerotor assembly and the depth of the pocket located in the charge pump adapter. To determine the displacement, refer to the table below.

Gerotor Pocket Depth

Displacement cm³/r [in³/r]	Depth of Pocket mm [in.]
6.9 [.42]	6.35 [.25]
13.8 [.84]	12.7 [.50]

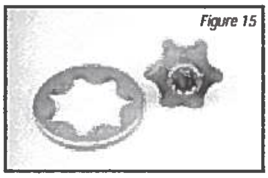


Figure 15

16 To separate the endcover assembly from the dowel pins in the pump housing assembly, insert two screwdrivers between endcover and housing assembly and pry upward (see Figure 16).

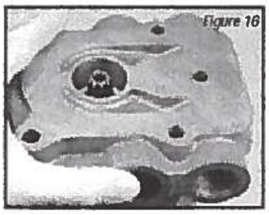


Figure 16

17 After separation, remove the endcover from the housing assembly.

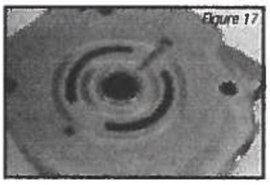


Figure 17

18 Turn the endcover assembly over and inspect the needle bearing. The needles in the needle bearing must remain intact in the bearing cage (see Figure 17).

19 When the needle bearing assembly is replaced, the numbered end of the bearing must face the valve plate side of the endcover to the dimension as shown (see Figure 18).

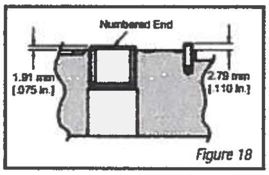


Figure 18

20 With the endcover removed, remove the gasket from the pump housing assembly and discard (see Figure 19).

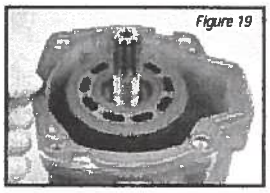


Figure 19

21 Remove the valve plate from the piston block assembly. Note: This valve plate may have stuck to the endcover assembly that was previously removed.

22 Valveplate directional rotation (CW or CCW) is identified by the location of the metering slots located on the face of the valve plates. Pump input rotation should always turn into the metering slots (see Figure 20). A clockwise valve plate is shown on the left and a counter clockwise valveplate is on the right. Note: Whenever pump input rotation is changed, the valve plate must be replaced along with the desired rotation charge pump adapter.

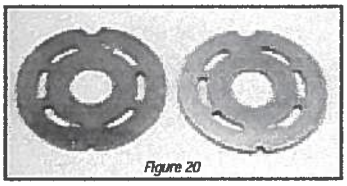


Figure 20

23 Remove the rotating kit assembly by carefully retaining it in the housing assembly (see Figure 21). Lift the housing and rotating kit assembly and turn over assemblies allowing the rotating kit assembly to slide down the input shaft and out of the pump housing.

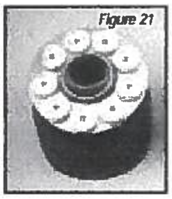


Figure 21

24 With the rotating kit assembly removed, remove the piston assemblies, spider and spider pivot from the piston barrel.(see Figure 22).

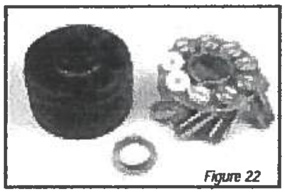


Figure 22

25 Inspect the piston assemblies, spider, spider pivot and piston block. The piston block assembly usually requires no further disassembly unless the pins or block spring are damaged.

26 When any excessive wear or scratches are noted on the face of the piston block, the block assembly must be replaced (see Figure 23).

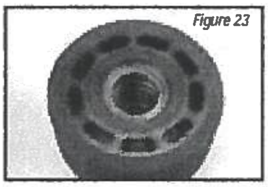


Figure 23

DO NOT LAP THE FACE OF PISTON BLOCK ASSEMBLY.

27 To remove the input shaft assembly, use a pair of internal snap ring pliers and remove the shaft seal retaining ring from the housing assembly (see Figure 24).

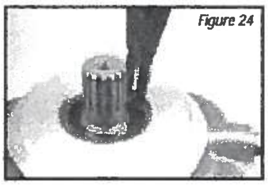


Figure 24

Repair Information - Disassembly

28 With the retaining ring removed, use a small press to press the shaft seal and input shaft assembly from the housing assembly.

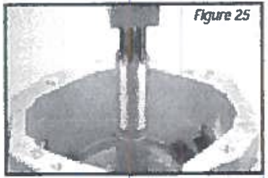


Figure 25

29 With the input shaft assembly removed, disassemble the assembly for inspection by removing the shaft seal, washer, retaining ring thrust washers and bearing (see Figure 26).

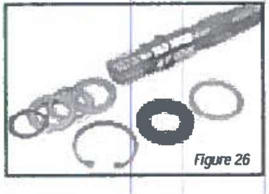


Figure 26

Note: The rear pump on tandem units uses a spacer in place of shaft seals.

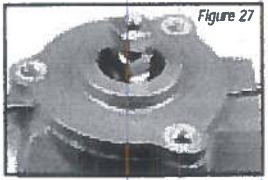


Figure 27

30 To remove the swashplate from the housing assembly, use a 9/16 in. socket or end wrench and remove the three cap screws retaining the control arm cover plate assembly. Start at the cover plate with control arm. (see Figure 27).

31 With the retaining cap screws removed, insert two small screwdrivers in the notches located in the cover plate assembly and pry upward. Make sure bearing cup comes off with the cover plate (see Figure 28).

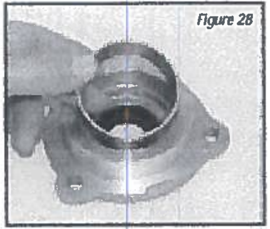


Figure 28

Note: The crush ring in the control arm trunnion cover does not need to be removed (see Figure 29). The only time the crush ring needs to be removed is when either the trunnion cover, the swashplate assembly or the housing assembly is replaced. A shim kit is then required in the crush rings place.

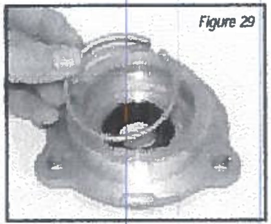


Figure 29

32 Reposition the pump assembly to remove opposite cover plate. The bearing cup in this cover plate is press fit and not removable. Repeat steps 30 through 31.

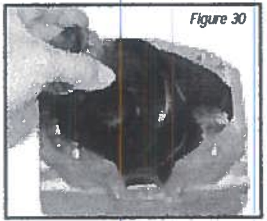


Figure 30

33 To remove swashplate, first use a small press and press the drive shaft needle bearing out of the housing.

34 With housing in the upright position rotate the swashplate upside down, slide the swashplate toward the control side and lift it from the pump housing (see Figure 30).

Note: The swashplate control shaft will fit out either side of the pump housing. Be sure to note on which side of the housing the control shaft protrudes before removing swashplate from housing for correct reassembly orientation.

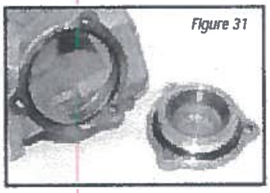


Figure 31

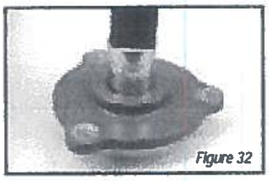


Figure 32

35 Use an o-ring pick or similar tool to remove the o-ring seals from the two counter-bores in the housing or the cover plates (see Figure 31).

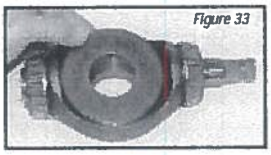


Figure 33

36 To remove the control side cover plate lip seal, use a small press and press the lip seal inward (see Figure 32).

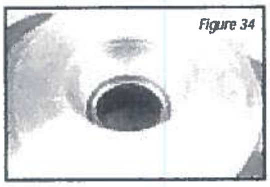


Figure 34

37 Remove the thrust plate from the swashplate. The thrust plate is reversible and either side may face the swashplate (see Figure 33).

38 When the needle bearing is replaced, the numbered end of the needle bearing must face away from the housing and pressed to the dimension as shown (see Figure 35).

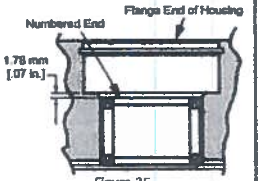


Figure 35

Repair Information - Reassembly

Reassembly

1 Before reassembling the pump, replace all worn and damaged parts, assemblies, seals and o-rings. Lubricate the seals and o-rings with petroleum jelly to help retain them during reassembly and to provide lubrication to the input and control shaft seals. Lubricate all finished part surfaces freely with clean hydraulic fluid to help provide start up lubrication between all rotating parts.

2 To reassemble the swashplate assembly into the pump housing, tilt the swashplate slightly and install the control side of the swashplate through the previously noted or marked side of the housing assembly (see Figure 36).

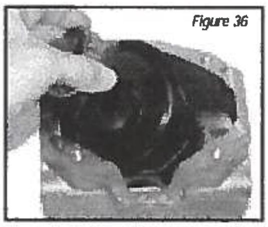


Figure 36

3 With the swashplate installed, lubricate the tapered bearing on the non-control arm side of the swashplate (see Figure 37).

4 Lubricate and install the o-ring seal into counter-bore of housing (see Figure 37).

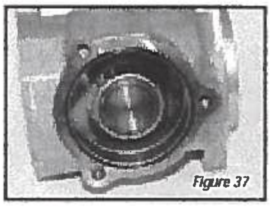


Figure 37

5 Install the trunnion cover over bearing and onto pump housing. Install the three cap screws and torque to 39,3 Nm [29 ft. lbs.] (see Figure 38).

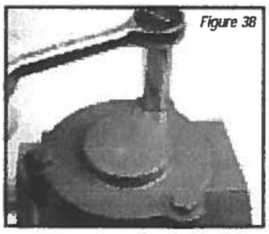


Figure 38

6 Lubricate and install the control arm shaft seal into the control arm cover plate. Install with the lip of the seal facing upward or to the inside of the pump (see Figure 39).

7 If the housing, trunnion covers or swashplate assembly have not been replaced, the existing crush ring may be re-used. If you have replaced anyone of the above a shim kit must replace the crush ring. See Parts Information manual for number.

8 Place the bearing cup into trunnion cover over the crush ring or shims (see Figure 40).

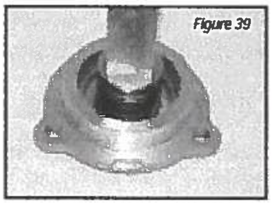


Figure 39

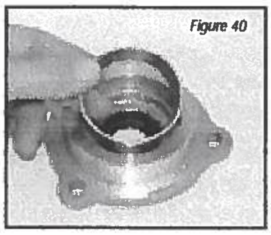


Figure 40

9 Lubricate and install the o-ring seal into counter-bore of housing (see Figure 41).

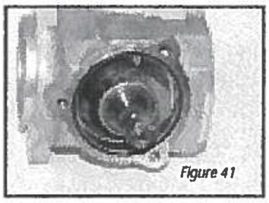


Figure 41

10 Install the trunnion cover over the control shaft and into the pump housing. Install the three retaining cap screws and torque to 39,3 Nm [29 ft. lbs.] (see Figure 42).

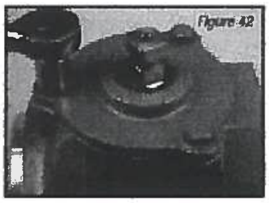


Figure 42

11 Using your fingers, tilt the swashplate back and forth to check the trunnion bearing preload. Proper preload is achieved when the swashplate has a very slight tilting resistance. The swashplate must not have any or very little side clearance.

12 Reassemble the input shaft assembly by installing the thrust washer, thrust bearing, second thrust washer, retaining ring, washer and shaft seal (see Figure 43).

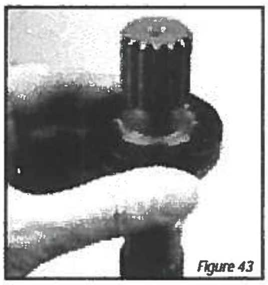


Figure 43

Note: The lip of the shaft seal must point toward the center of the input shaft.

13 Install the input shaft assembly into the housing assembly. Push the shaft seal in just far enough so you can start the shaft seal retaining ring.

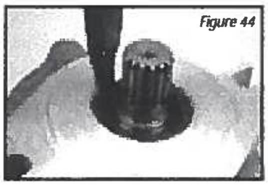


Figure 44

14 Use a pair of snap ring pliers to install retaining snap ring into the housing assembly (see Figure 44).

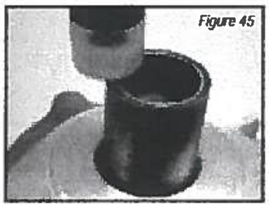


Figure 45

15 Use a seal driver or similar tool to press or drive the snap ring and seal into the housing assembly (see Figure 45).

CAUTION! Press or drive inward until the snap ring snaps into the snap ring groove located in the pump housing assembly.

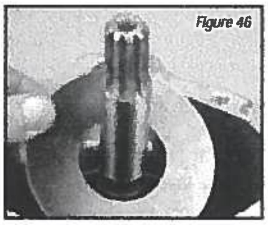


Figure 46

16 The thrust plate is reversible. Either side will fit into the

Repair Information - Reassembly

swashplate. In most cases if any irregularities are noted it is best to replace the thrust plate (see Figure 46).

18 Lubricate and install the thrustplate over the input shaft assembly and into the swashplate. The thrustplate must rest firmly in its pocket located in the swashplate.

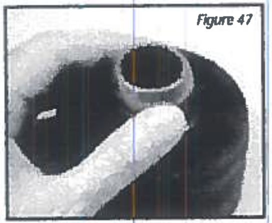
19 Reassemble the rotating kit assembly by first aligning the splines in the pivot with the splines in the block. Install the pivot on the block assembly pins (see Figure 47).

20 Use a small socket or similar tool to help retain the pivot in the centered position. Lubricate and install the spider and piston assemblies onto the pivot and pistons into the piston block assembly (see Figure 48).

21 Hold the housing assembly in the vertical position then carefully install the rotating kit by first aligning with the splines on the input shaft. With splines aligned, install the rotating kit into the pump housing (see Figure 50). Use caution to ensure all parts are kept in their proper position.

22 With the rotating kit installed, reposition the housing assembly in the input shaft down position and install a new housing gasket (see Figure 50).

23 Lightly coat the endcover side of the valve plate with petroleum jelly for retention during assembly. Install the valve plate over the needle bearing, aligning the small slot on the outside of the valve plate with the dowel pin in the endcover (see Figure 51).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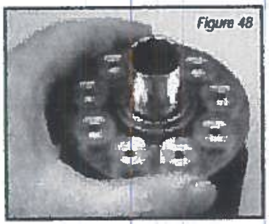
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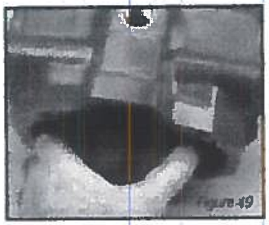
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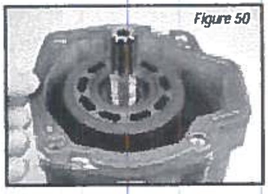
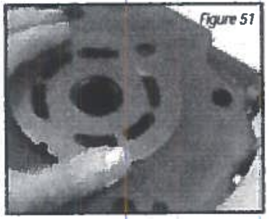


Figure 50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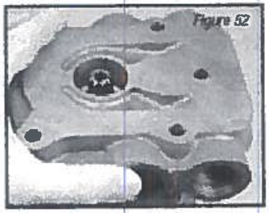
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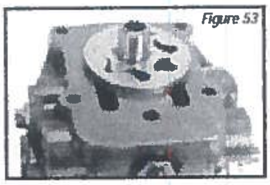


Figure 53

24 Carefully install the endcover assembly by aligning it with the dowel pins located in the pump housing. Use caution not to dislodge the valve plate (see Figure 54).

25 Align the spline of the gerotor's inner ring, then lubricate and install the inner ring and outer ring over the input shaft and onto the endcover assembly (see Figure 53).

Note: Before installing the charge pump adaptor plate, offset the outer ring of the geroter as shown.

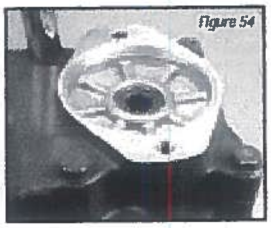


Figure 54

26 With the gerotor assembly installed, install new o-ring into charge pump adapter plate and place adapter onto endcover over gerotor. Retain with cap screws. Torque cap screws to 25 N•m [18.5 lbf•ft] (see Figure 54).

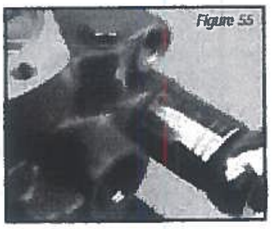


Figure 55

27 Install the two high pressure relief valves. Torque valves 128,8 to 142,4 N•m [95 to105 lbf•ft] (see Figure 55).

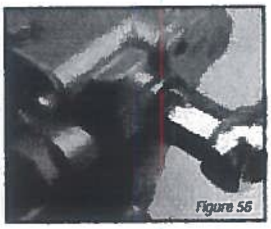


Figure 56

29 Lubricate and reassemble the bypass valve assembly. Install the bypass valve into the endcover. Torque valve to 30,5±2 N•m [22.5±1.5 lbf•ft] (see Figure 56).

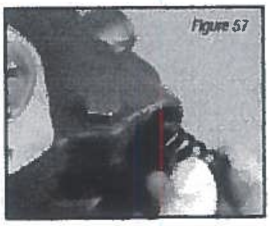


Figure 57

30 Coat the charge pressure poppet with petroleum jelly and place poppet onto spring and install into the adapter plate (see Figure 57).

31 Install the hollow charge pressure relief valve retainer into the adapter plate. Torque retainer to 6,8 to 9,5 Nm [5 to 7 lbf•ft].

32 Lubricate and install the o-ring on the cover plate or gear pump. Install the cover plate or gear pump and two cap screws. Torque cap screws to 36,6 to 40 Nm [27 to 31 lbf•ft].

The Model 70160 or 78162 variable displacement pump is now ready for test and reinstallation.

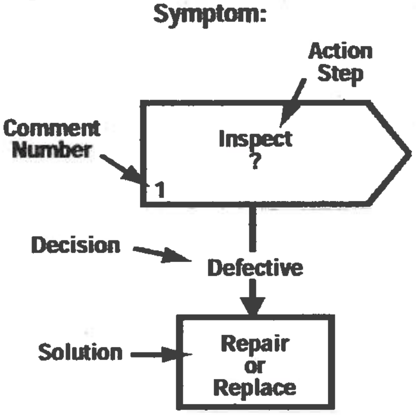
Fault - Logic Troubleshooting

This fault - logic troubleshooting guide is a diagnostic aid in locating transmission problems.

Match the transmission symptoms with the problem statements and follow the action steps shown in the box diagrams. This will provide help in correcting minor problems eliminating unnecessary machine down time.

Following the fault - logic diagrams are diagram action comments of the action steps shown in the diagrams. Where applicable, the comment number of the statement appears in the action block of the diagrams.

Explanatory Diagram



Recommended Gauge Locations

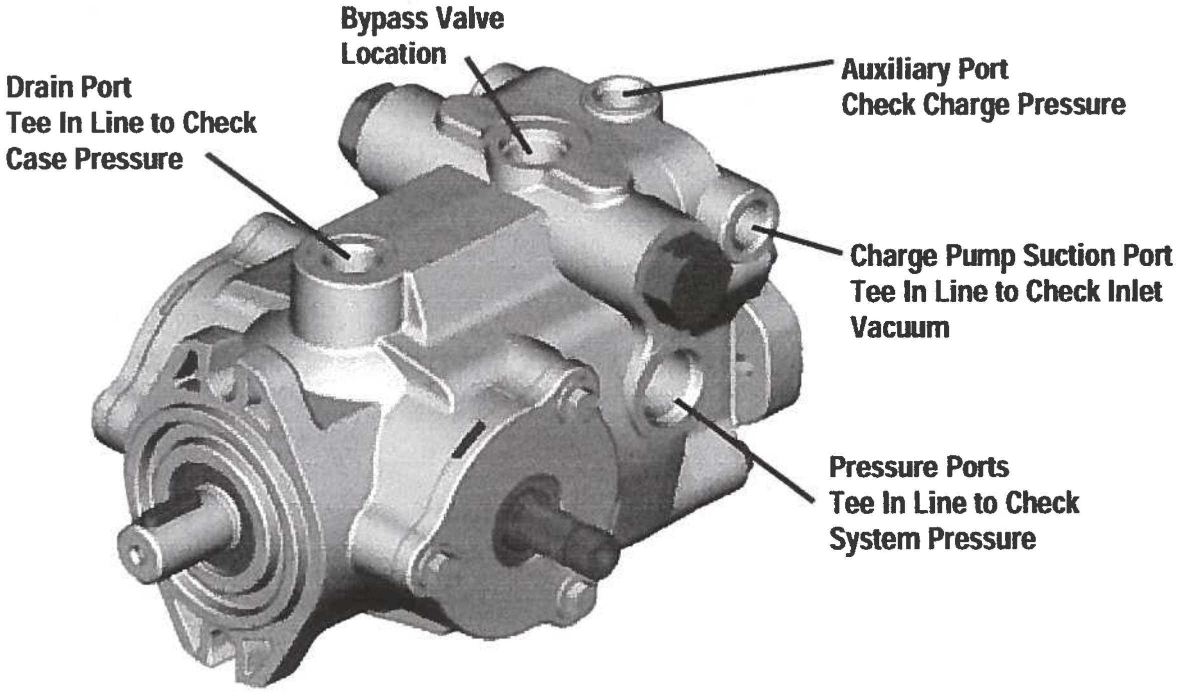
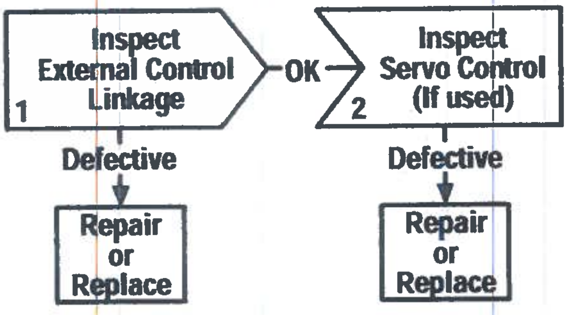

Bypass Valve Location
Drain Port Tee In Line to Check Case Pressure
Auxiliary Port Check Charge Pressure
Charge Pump Suction Port Tee In Line to Check Inlet Vacuum
Pressure Ports Tee In Line to Check System Pressure

Figure 58

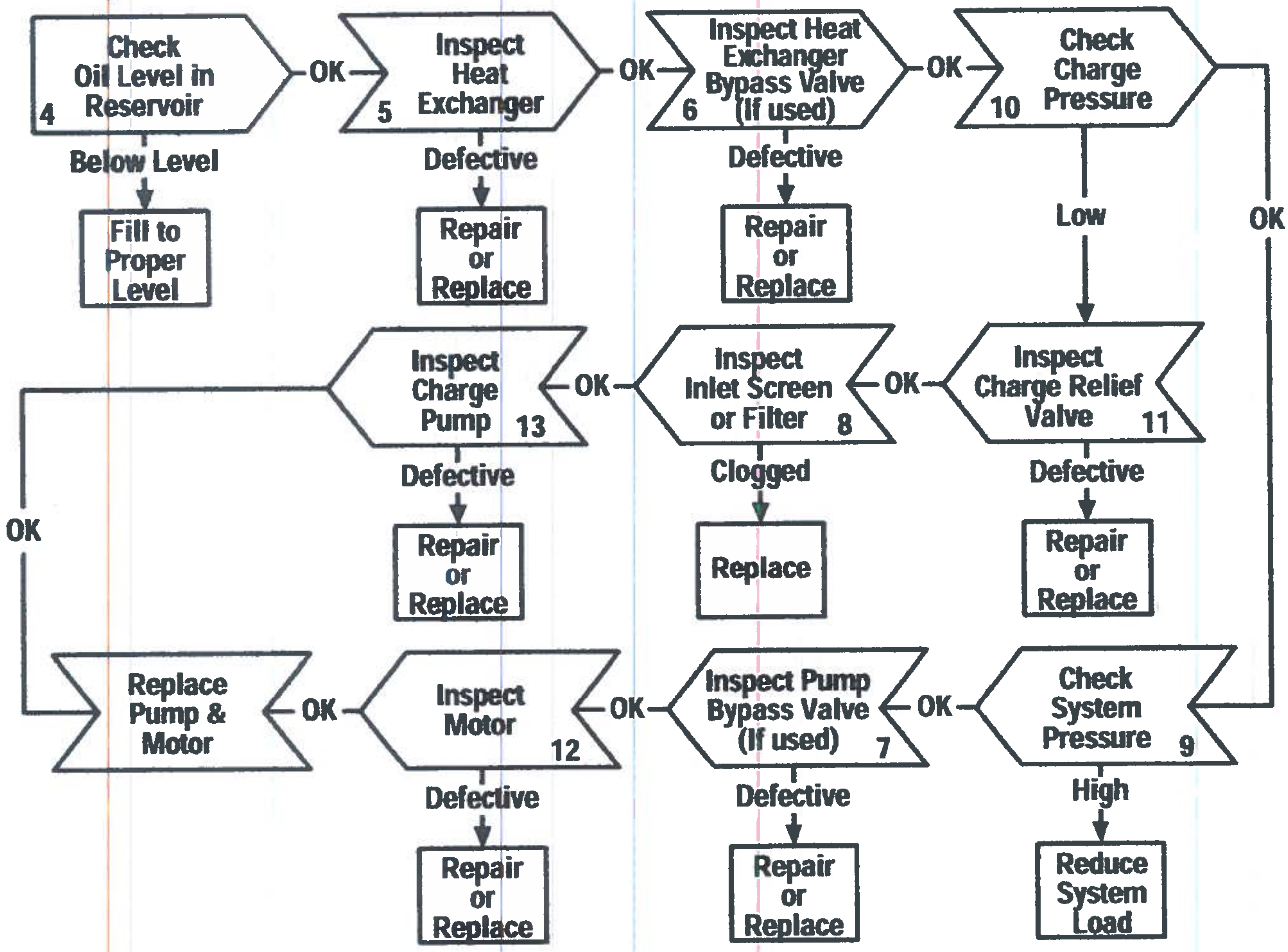
Gauges Recommended
Inlet vacuum gauge: 2 bar to 1 bar [30 PSI to 30 inHg]
System pressure gauge: 700 bar [10,000 PSI]
Charge pressure gauge: 0 to 50 bar [0 to 600 PSI]
Case pressure gauge: 0 to 25 bar [0 to 300 PSI]

Fault - Logic Troubleshooting

Symptom: Neutral Difficult or Impossible to Find

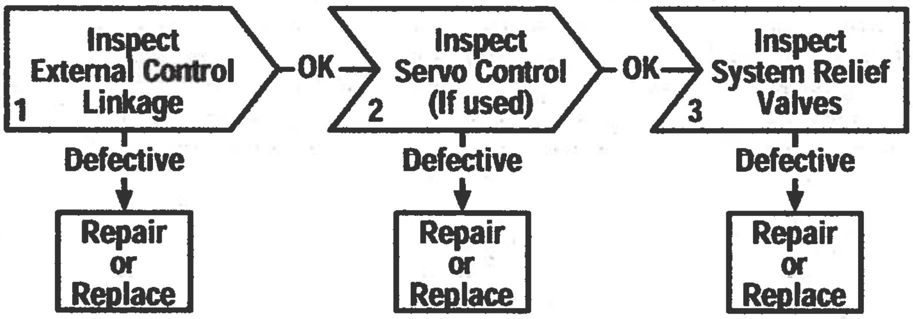

1 Inspect External Control Linkage
OK
2 Inspect Servo Control (If used)
Defective
Repair or Replace
Defective
Repair or Replace

Symptom: System Operating Hot

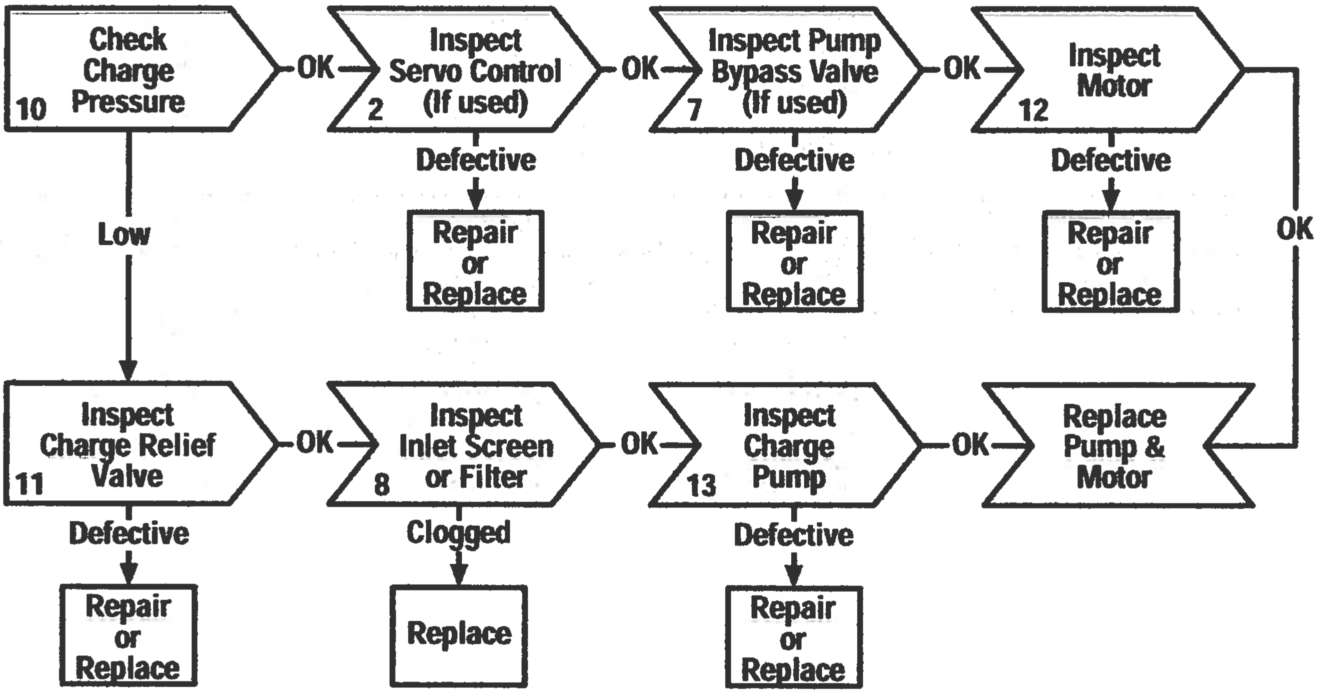


Fault - Logic Troubleshooting

Symptom: Operates in One Direction Only

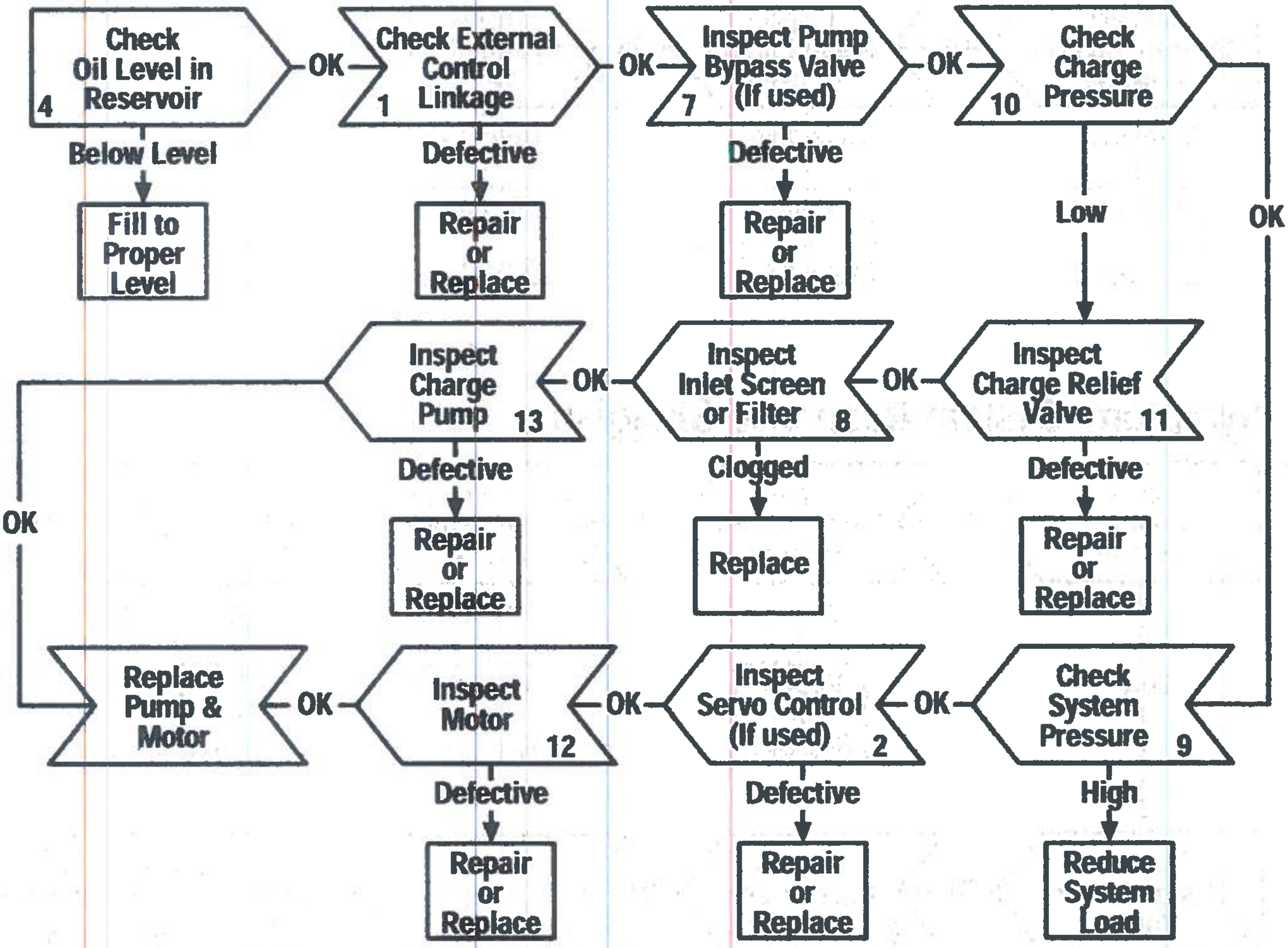

1 Inspect External Control Linkage
OK
2 Inspect Servo Control (If used)
OK
3 Inspect System Relief Valves
Defective
Repair or Replace
Defective
Repair or Replace
Defective
Repair or Replace

Symptom: System Response Sluggish



Fault - Logic Troubleshooting

Symptom: System Will Not Operate In Either Direction



Fault - Logic Troubleshooting

Diagram Action Step Comments

1 **Inspect External Control Linkage for:**
   - a. misadjustment or disconnection
   - b. binding, bending or breakage
   - c. misadjusted, damaged or broken neutral return spring

2 **Inspect Servo Control Valve for: (if used)**
   - a. proper inlet pressure
   - b. misadjusted, damaged or broken neutral return spring
   - c. galled or stuck control spool
   - d. galled or stuck servo piston

3 **Inspect System Relief Valves* for:**
   - a. improper pressure relief setting
   - b. damaged or broken spring
   - c. valve held off seat
   - d. damaged valve seat

4 **Check Oil Level in Reservoir:**
   - a. consult owner/operators manual for the proper type fluid and level

5 **Inspect Heat Exchanger for:**
   - a. obstructed air flow (air cooled)
   - b. obstructed water flow (water cooled)
   - c. improper plumbing (inlet to outlet)
   - d. obstructed fluid flow

6 **Inspect Heat Exchanger Bypass Valve for: (if used)**
   - a. improper pressure adjustment
   - b. stuck or broken valve

7 **Inspect Pump Bypass Valve for: (if used)**
   - a. held in a partial or full open position

8 **Inspect Inlet Screen or Filter for:**
   - a. plugged or clogged screen or filter element
   - b. obstructed inlet or outlet
   - c. open inlet to charge pump

9 **Check System Pressure:**
   - a. See figure 60 for location of pressure gauge installation.
   - b. consult owner/operators manual for maximum system relief valve settings

10 **Check Charge Pressure:**
   - a. See figure 60 for location of pressure gauge installation.
   - b. consult owner/operators manual for maximum charge relief valve settings

11 **Inspect Charge Relief Valve for:**
   - a. improper charge relief pressure setting *
   - b. damaged or broken spring
   - c. poppet valve held off seat

12 **Inspect Motor for:**
   - a. disconnected coupling

13 **Inspect Charge Pump for:**
   - a. broken or missing drive key
   - b. damaged or missing o-ring
   - c. excessive gerotor clearance
   - d. galled or broken gerotor set

*** System/Charge Relief Valve Pressure Settings for Eaton's Variable Displacement Controlled Piston Pumps**

Inlet Vacuum	6 inHg max.
Case Pressure	25 PSI maximum
Charge Pressure	100 to 150 PSI Standard 200 to 250 PSI Optional 250 to 300 PSI Optional
System Pressure	5000 PSI maximum 3000 PSI continuous

The high pressure relief valves are all factory preset and cannot be readjusted.

The pressure setting and assembly number is stamped on each high pressure relief valve cartridge.

Valve Identification Example:

32060-IA 5000

5000 — Relief Valve Setting

32060-IA — Relief Valve Assembly Number

Start-up Procedure

When starting a new or rebuilt transmission system, it is extremely important to follow the start-up procedure. It prevents the chance of damaging the unit which might occur if the system was not properly purged of air before start-up.

1 After the transmission components have been properly installed, fill the pump housing at least half full with filtered system oil. Connect all hydraulic lines and check to be sure they are tight.

2 Install and adjust all control linkage.

3 Fill the reservoir with an approved oil that has been filtered through a 10 micron filter. Refer to Eaton Hydraulics Technical Data Sheet number 3-401 titled Hydraulic Fluid Recommendations.

4 For Gasoline engines or L.P. engines remove the coil wire and turn the engine over for 15 seconds. For Diesel engines shut off the fuel flow to the injectors and turn the engine over for 15 seconds.

5 Replace the coil wire or return the fuel flow to the injectors. Place the transmission unit in the neutral position, start the engine and run it at a low idle. The charge pump should immediately pick up oil and fill the system. If there is no indication of fill in 30 seconds, stop the engine and determine the cause.

6 After the system starts to show signs of fill, slowly move pump swashplate to a slight angle. Continue to operate system slowly with no load on motors until system responds fully.

7 Check fluid level in the reservoir and refill if necessary to the proper level with an approved filtered oil.

8 Check all line connections for leaks and tighten if necessary.

The machine is now ready to be put into operation.

Frequent filter changes are recommended for the first two changes after placing the machine back into operation. Change the first filter in 3-5 hours and the second in approximately 50 hours. Routinely scheduled filter changes are recommended for maximum life of the hydraulic system.

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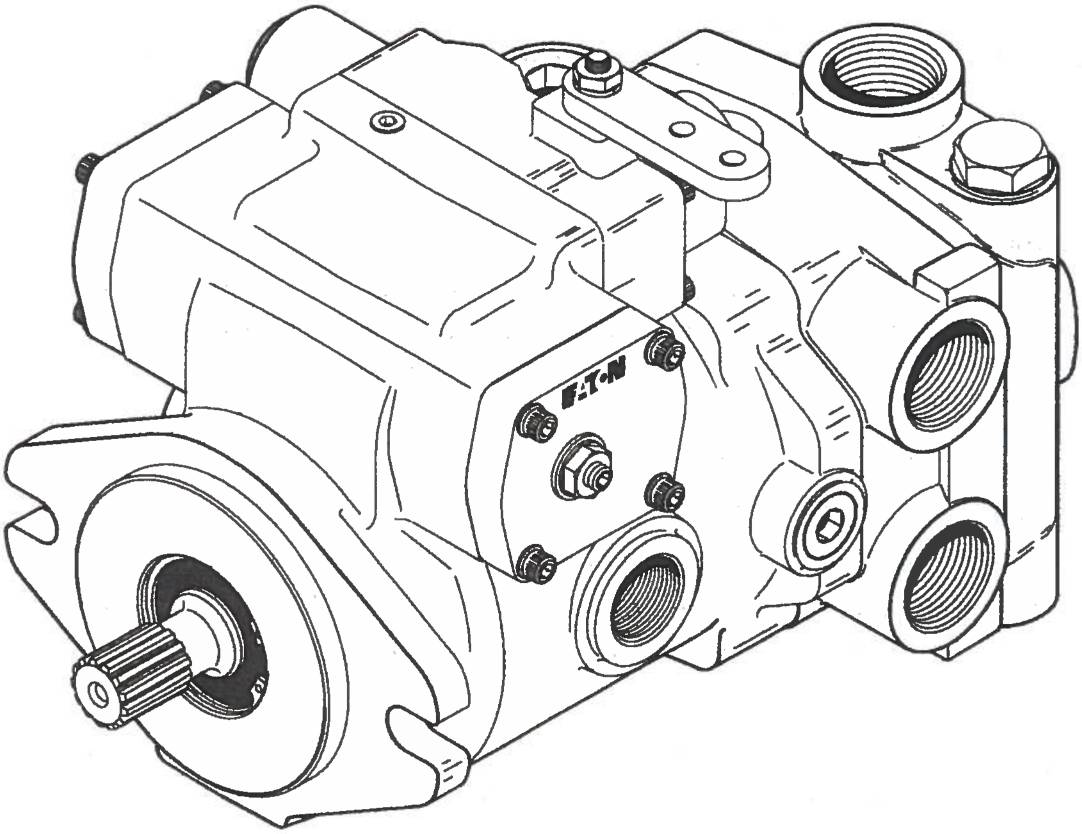
December 2002

Eaton®
Medium Duty Piston Pump

No. 07-06-629
EN-0800
(Replaces 07-629)

Repair Information



Model 72400
Servo Controlled Piston Pump

v-04

Introduction

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Introduction

This manual provides service information for the Eaton Model 72400 Servo Controlled Piston Pumps. Step by step instructions for the complete disassembly, inspection, and reassembly of the pump are given. The following recommendations should be followed to insure successful repairs.

- Remove the pump from the vehicle.
- Cleanliness is extremely important.
- Clean the port areas thoroughly before disconnecting the hydraulic lines.
- Plug the pump ports and cover the open hydraulic lines immediately after they're disconnected.
- Drain the oil and clean the exterior of the pump before making repairs.
- Wash all metal parts in clean solvent.
- Use compressed air to dry the parts. Do not wipe them dry with paper towels or cloth.
- The compressed air should be filtered and moisture free.
- Always use new seals when reassembling hydraulic pumps.
- For replacement parts and ordering information refer to parts list 06-06-642.
- Lubricate the new rubber seals with a petroleum jelly (Vaseline) before installation.
- Torque all bolts over gasketed joints, then repeat the torquing sequence to make-up for gasket compression.
- Verifying the accuracy of pump repairs on an authorized test stand is essential.

Identification and Tools Required

Identification Numbers

Stamped on each unit.

A - Product Number Discription
  72400 = Single Piston Pump
  78461 = Tandem Piston Pump
  78462 = Single Piston Pump with Gear Pump
  78463 = Tandem Piston Pumps with Gear Pump
B - Sequential Numbering
C - Design Code Number

Single Pump - Product Number

72400 - 001 - 04
A B C

Tandem Pumps - Product Number

78461 - 001 - 04
A B C

Serial Number Code:

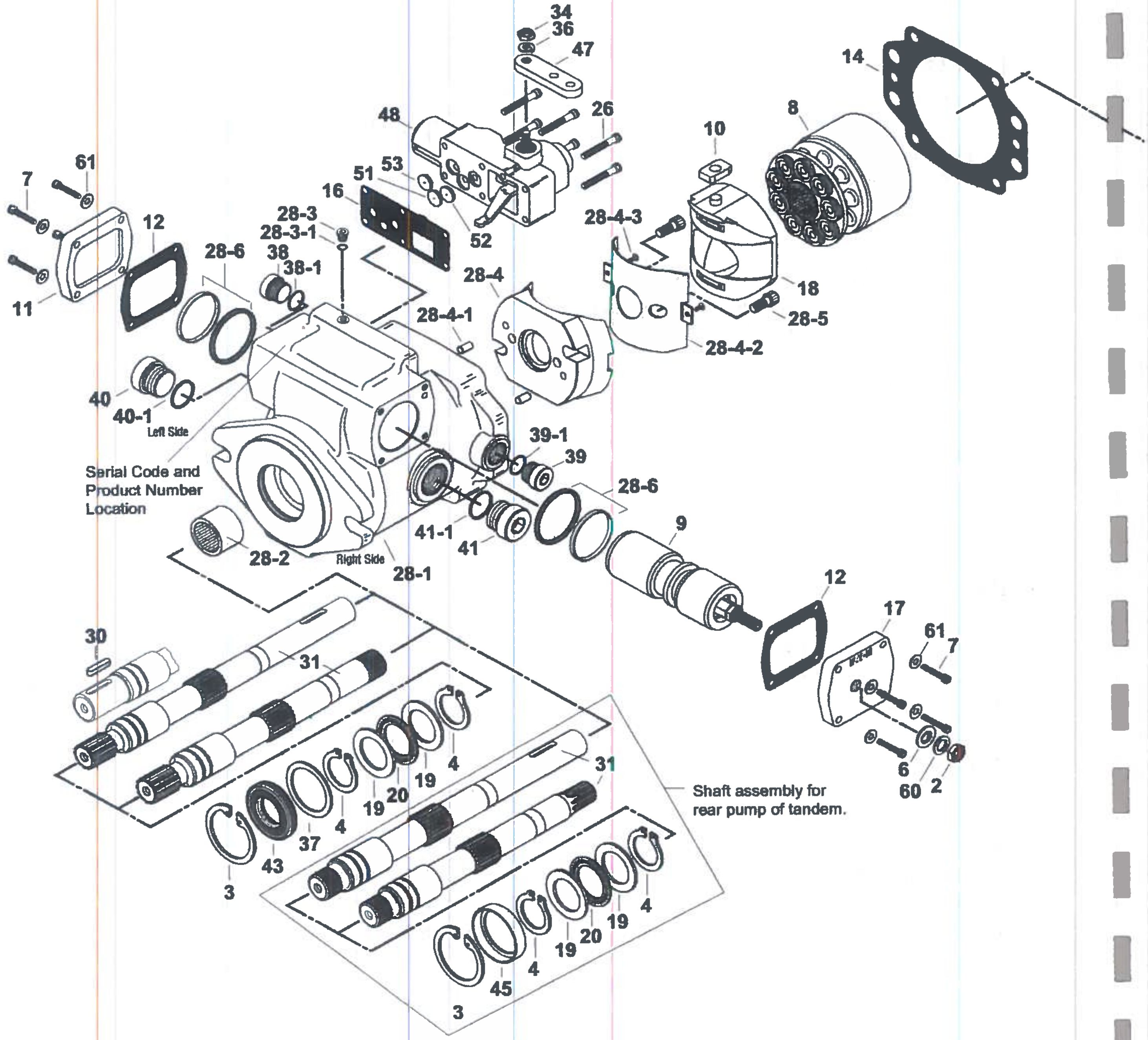
B 93 01 31 JB

B — Revision level of parts list.
93 — Last two digits of year built. (93 for 1993 etc.)
01 — Month (two digits)
31 — Day of Month (two digits)
JB — Testers Initials

Required Tools

- 9/16 in. Hex Key (Allen)
- 5/32 in. Hex Key (Allen)
- 5/16 in. Hex Key (Allen)
- 3/32 in. Hex Key (Allen)
- 5/64 in. Hex Key (Allen)
- 7/16 in. End Wrench
- 9/16 in. End Wrench
- 3/4 in. End Wrench
- 1 in. End Wrench
- 9/16 in. Socket
- 3/4 in. Socket
- 7/16 in. Socket
- Internal Retaining Ring Pliers (straight .070 tip)
- Internal Retaining Ring Pliers (straight .090 tip)
- External Retaining Ring Pliers (straight .090 tip)
- 9/32 in. retaining E-ring, applicator
- 1/2 in. retaining E-ring, applicator
- O-ring Pick
- Torque Wrench (135.6 N•m [100 lbf•ft] capacity)
- Hammer (soft face)
- Light Petroleum Jelly
- Seal Driver
- Arbor Press
- Loctite (#222, #242, and #277 or equivalent)

Parts Drawing - Figure 1-1



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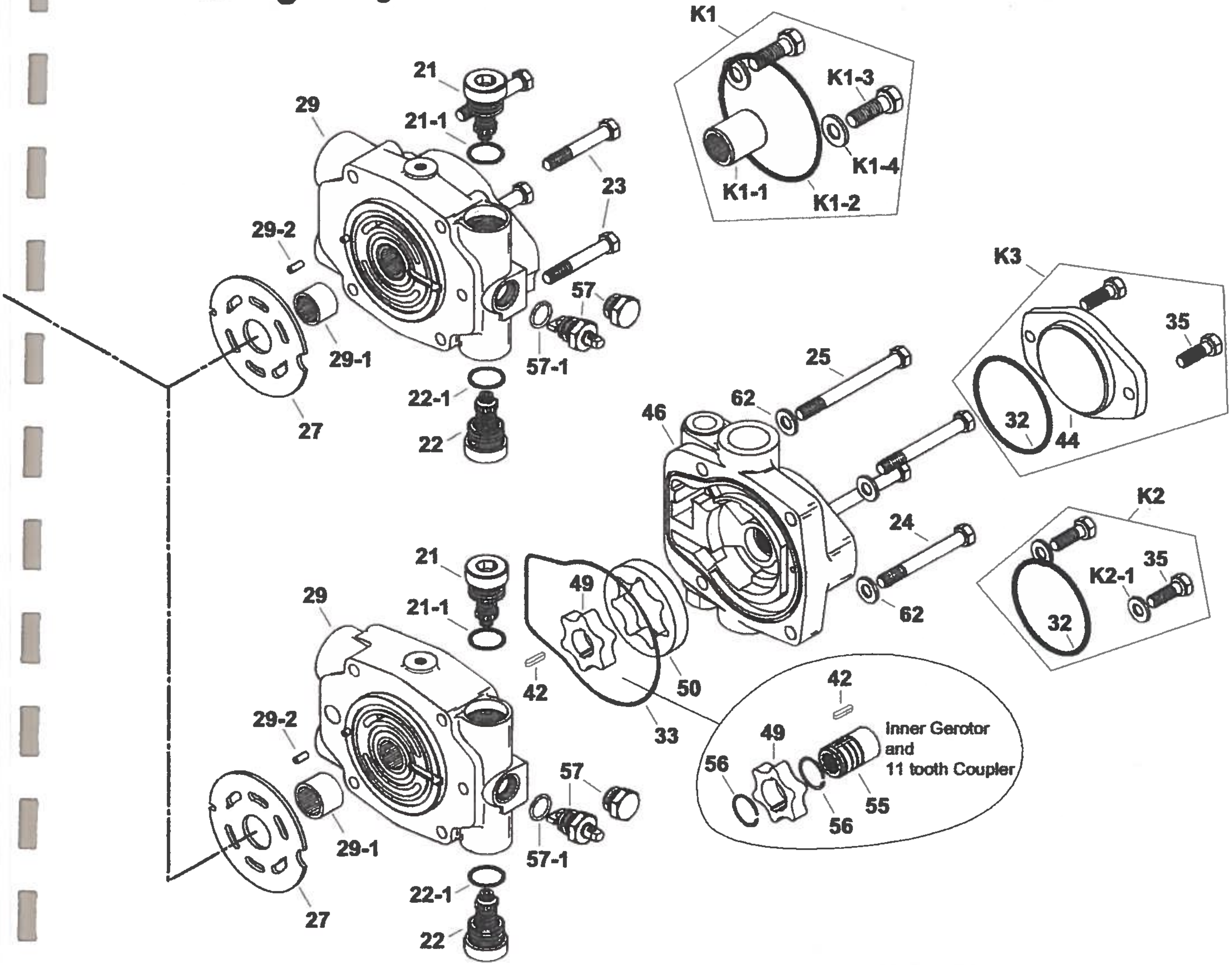
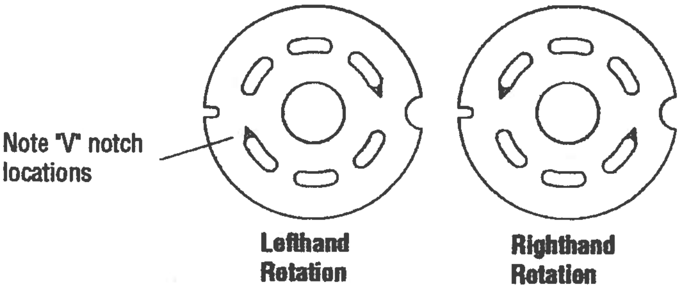
Parts Drawing - Figure 1-1



Valve Plate Identification



Parts List

	Item	Qty.	Description
	2	1	Jam Nut
+	3	1	Retaining Ring
+	4	2	Retaining Ring
+	6	1	Seal Washer
	7	8	Cap Screw, #10-24, 25,4mm [1.0 in.] Long
	8	1	Rotating Kit Assenbly
	9	1	Servo Piston Assembly
	10	1	Servo Piston Follower
	11	1	Cover Plate
+	12	2	Cover Plate Gasket
+	14	1	Housing Gasket
+	16	1	Control Housing Gasket
	17	1	Cover Plate
	18	1	Swashplate
	19	2	Thrust Race
	20	1	Thrust Bearing
	21	1	Relief Valve for Port "A"
+	21-1	1	O-ring, 2,95 mm Dia. x 23,47 mm I.D. [.116 in. Dia. x .924 in. I.D.]
	22	1	Relief Valve for Port "B"
+	22-1	1	O-ring, 2,95 mm Dia. x 23,47 mm I.D. [.116 in. Dia. x .924 in. I.D.]
	23	4	Cap Screw, 3/8-16, 57,2 mm [2.25 in.] Long
	24	2	Cap Screw, 3/8-16, 88,9 mm [3.5 in.] Long
	25	2	Cap Screw, 3/8-16, 101,6 mm [4.0 in.] Long
	26	6	Cap Screw
	27	1	Valve Plate
	28	1	Housing Assembly
	28-1	1	Housing
	28-2		Bearing (press fit)
	28-3	1	Plug Sub-Assembly
+	28-3-1	1	O-ring, 1,63 mm Dia. x 6,1 mm I.D. [.064 in. Dia. x .239 in. I.D.]
	28-4	1	Cradle Sub-Assembly
	28-4-1	2	Dowel Pin
	28-4-2	1	Bushing
	28-4-3	2	Cap Screw, Button Head
	28-5	2	Cap Screw
	28-6	2	Seal Sub-Assembly
	29	1	endcover Assembly
	29-1	1	Bearing (press fit)
	29-2	1	Roll Pin
	30	1	Key
	31	1	Drive Shaft
+	32	1	O-ring,1,59 mm Dia. x 82,55 mm I.D. [.0625 in. Dia. x 3.25 in. I.D.]
+	33	1	Molded O-ring
	34	1	Nut
	35	2	Cap Screw, 3/8-16, 25,4 mm [1.0 in.] Long
	36	1	Lockwasher
	37	1	Washer
	38	1	Plug
+	38-1	1	O-ring, 2,21 mm Dia. x 16,36 mm I.D. [.087 in. Dia. x .644 in. I.D.]

Parts List

	Item	Qty.	Description
	39	1	Plug
+	39-1	1	O-ring, 2,21 mm Dia. x 16,36 mm I.D. [.087 in. Dia. x .644 in. I.D.]
	40	1	Plug
+	40-1	1	O-ring, 2,95 mm Dia. x 23,47 mm I.D. [.116 in. Dia. x .924 in. I.D.]
	41	1	Plug
+	41-1	1	O-ring, 2,95 mm Dia. x 23,47 mm I.D. [.116 in. Dia. x .924 in. I.D.]
	42	1	Key
+	43	1	Shaft Seal
	44	1	Cover Plate
	45	1	Spacer
	46	1	Charge Pump Adapter Assembly
	47	1	Control Arm
	48	1	Manual Servo Control Assembly
	49	1	Inner Ring Gerotor
	50	1	Outer Ring Gerotor
	51	1	Supply Orifice
	52	1	Control Valve Orifice
	53	1	Control Valve Orifice
	55	1	Coupler, 11 tooth
	56	2	Retaining Ring
	57	1	Bypass Valve Actuator or Plug
	57-1	1	O-ring - 2,21 mm Dia. x 16,36 mm I.D. [.087 in. Dia. x .644 in. I.D.]
	60	1	Washer
	61	8	Washer
	62	4	Washer

Kits

	K1	1	Tandem Servo Piston Pump Mounting Kit
	K1-1	1	Coupler
+	K1-2	1	O-ring, 1,59 mm Dia. x 101,6 mm I.D. [.0625 in. Dia. x 4 in. I.D.]
	K1-3	2	Cap Screw, 1/2-13, 31,75 mm [1.25 in.] Long
	K1-4	2	Washer
	K2	1	Gear Pump Mounting Kit Includes Items 32 and 35
	K2-1	2	Washer
	K3	1	Cover Plate Kit for "A" SAE Flange Series 82-2 Mount Includes Items 32, 35, and 44
		1	72400-908, Seal Repair Kit for single pumps (Two Required for Tandem Units)

+ Parts included in 72400-908 Seal Repair Kit

Disassembly

Disassembly - Servo Controlled Piston Pump

The following instructions apply to a single servo controlled piston pump with or without a gerotor charge pump. A tandem pump assembly should be separated into individual pumps before disassembly.

1 Position the pump into a protected jaw vise, clamping onto the outer portion of the flange, with the cap screws up. Mark the relationship of the working ports (for reassembly identification) to the servo control assembly with a scribe. Remove the four cap screws retaining endcover.

No gerotor charge pump skip to step 6.

2 Lift the charge pump adapter assembly straight up off endcover, shaft, and gerotor. Gerotor may stay in adapter or on endcover.

3 Remove o-ring from charge pump adapter.

4 Remove outer gerotor ring from either the charge pump adapter or the inner gerotor ring.

Refer to Appendix A for disassembly and inspection of charge pump adapter assembly.

5 Remove the inner gerotor ring and key from drive shaft or inner gerotor ring and coupler assembly from shaft.

6 Lift endcover straight up off shaft and housing. Remove valve plate from endcover or from rotating kit assembly, still in housing.

7 From endcover, remove bypass valve or plug, and relief valve assemblies. Note: Mark the relief valve in relationship to the cavity it was removed, for reassembly purposes.

Endcover Inspection:

- Check the bearing (press fit) in endcover. If needles remain in cage, move freely, and setting is at the dimension shown in figure 1-3, removal not required.
- Check roll pin in endcover. If tight and set to the dimension shown in figure 1-3, removal not required.

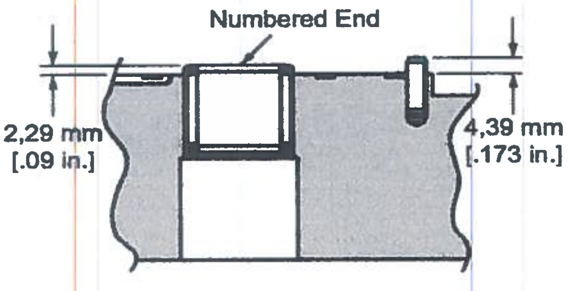


Figure 1-3

8 Remove housing gasket from housing or endcover.

9 With pump still in vise, remove the six cap screws retaining the manual servo control assembly. Remove the control assembly and control housing gasket from the housing. Remove orifice plates, noting location for reassembly. Remove nut and lock washer from control arm, remove arm. Note position of control arm for reassembly.

Refer to Appendix B for disassembly and Inspection of control assembly.

10 To remove rotating kit assembly from housing, first remove pump from vise holding the rotating kit assembly in position. Lower pump so that the shaft end (flange end) is up. Set the rear of housing onto table with housing flat and rotating kit assembly at rest on table. (Hole in table, for protruding shaft, is required.) Lift and remove the housing and shaft from rotating kit assembly, and swashplate.

11 Remove swashplate from rotating kit assembly and servo piston follower from swashplate.

Refer to Appendix C for disassembly and Inspection of rotating kit.

Swashplate Inspection:

- The finish on the piston shoe surfaces of the swashplate should show no signs of scoring.
- Inspect swashplate bushing surface for wear and surface for coating transfer from bushing.

12 To remove servo piston assembly from housing, start with the four each cap screws and washers retaining each cover plate.

13 In removing the cover plate from the servo piston bolt, remove jam nut, washer, and seal washer. Hold the servo piston bolt with hex key and unscrew cover plate off of bolt.

14 Remove servo piston assembly and seal sub-assemblies (two sets) from housing. Note: Disassembly of servo piston assembly is not required.

15 Remove retaining ring from the front of housing. Press the shaft, shaft seal or spacer, and washer from housing. Remove retaining ring, thrust washer, thrust bearing, second thrust washer, and second retaining ring from shaft.

Disassembly and Reassembly

Housing Inspection:

- Check the bearing (press fit) in housing. If needles remain in cage, move freely, and setting at the dimension shown in figure 1-4, removal not required.

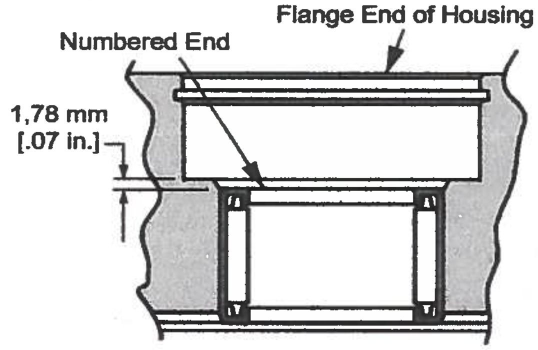


Figure 1-4

16 To remove cradle sub-assembly, remove the two cap screws retaining cradle inside housing. Removing cradle sub-assembly from housing.

17 Remove button head cap screws (qty. 2) to remove bushing from cradle.

Bushing Inspection:

- Inspect bushing for contamination embedment within coating of bushing surface coming in contact with swashplate.

18 Remove all plugs from housing.

19 Discard the shaft seal, gaskets, and o-rings from all assemblies. Replace with new seals upon reassembly.

Reassembly - Servo Controlled Piston Pump

1 All parts should be cleaned and critical moving parts lubricated before reassembly.

2 If necessary, press new bearing in housing to dimension shown in figure 1-4 with the numbered end of bearing outward.

3 Install the two new seal sub-assemblies into the servo piston cavity of housing.

4 Screw the cover plate onto the servo piston assembly. Install new cover plate gasket in place on housing. Install servo piston assembly and cover plate into servo piston bore in right side of housing (as shown in figure 1-1 and figure 1-5). Retain cover plate with four each washers and cap screws. Torque cap screws 4.5 to 5.4 N•m [40 to 48 lbf•in.]. To obtain neutral, centering the servo piston assembly is required. Measure in from the left side and set servo piston 12,7 mm [.5 in.] from surface of housing servo bore as shown in figure 1-5.

Note: Re-adjustment may be required for neutral at unit start-up.

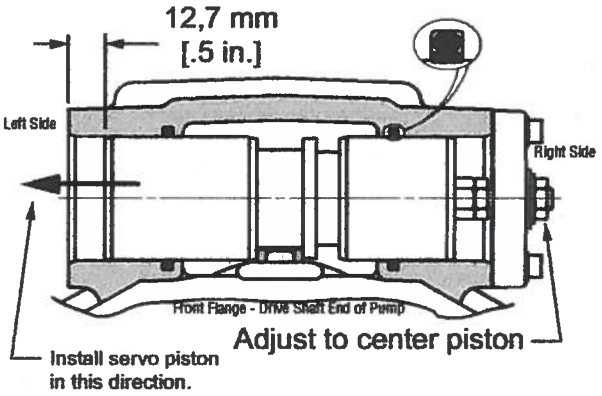


Figure 1-5

5 Install new seal washer, washer, and jam nut to servo piston bolt. Holding servo piston bolt with hex key wrench Torque jam nut 17 to 18 N•m [150 to 160 lbf•in]. Check the centering of servo piston assembly. Install new cover plate gasket and cover plate to left side of servo piston and retain with four each washers and #10-24 cap screws. Torque cap screws 4,5 to 5,4 N•m [40 to 48 lbf•in.].

6 To assemble cradle sub-assembly, install bushing onto cradle retaining with button head cap screws. Torque button head cap screw 1,6 to 1,8 N•m [14 to 16 lbf•in.]

7 Place cradle sub-assembly into housing making sure cradle is completely seated into housing. Retain cradle sub-assembly with two cap screws. Torque cap screws 27 to 33 N•m [20 to 24 lbf•ft].

8 To install shaft, place exterior retaining ring, thrust race, thrust bearing, second thrust race, and second retaining ring onto shaft. Position washer and shaft seal or spacer onto shaft.

9 Install shaft assembly into front of housing for units with spacer, retain with interior retaining ring and go on to step 10. For units with shaft seal, seat seal into position with seal driver and retain with interior retaining ring.

10 Install servo piston follower onto swashplate dowel pin. Install swashplate carefully onto bushing (coat bushing surface with hydraulic oil), aligning servo piston follower with slot in servo piston assembly.

Reassembly

Refer to Appendix C for reassembly of rotating kit assembly.

11 To install rotating kit assembly, leave housing and shaft in the horizontal position. Holding swashplate into position with screw driver thru controller linkage passageway at the top of housing, place rotating kit assembly over shaft and into housing until pistons are in against swashplate. Make sure all parts are in housing completely and properly positioned. Return the pump to the vise with open end of housing up, clamping housing on the outer portion of the flange.

12 Install gasket on to housing.

13 If necessary, press new bearing and roll pin in endcover to dimension shown in figure 1-3. Bearing installed with the numbered end outward. Roll pin installed with split oriented away from bearing.

14 Install new o-ring on relief valves. Install relief valve in its original cavity in endcover that it was removed. Torque 136 to 149 N•m [100 to 110 lbf•ft.]

15 Install new o-ring on bypass valve or plug. Install bypass valve or plug into endcover. Note: Make sure paddle of bypass valve is perpendicular to relief valve axis prior to installing or damage could result.

16 Apply a small amount of petroleum jelly to the steel side of valve plate to hold in place for installation. Aligning the index pin, place the valve plate in position onto the endcover, with steel side against endcover.

17 Install endcover assembly onto housing assembly. Make sure ports are positioned correctly, valve plate and gasket stay in place.

No gerotor charge pump, skip to step 20.

18 Install key and inner ring gerotor onto shaft or coupler assembly. Lubricate inner ring gerotor.

Refer to Appendix A for reassembly of charge relief valve in adapter plate.

19 Install o-ring and outer ring gerotor onto adapter plate. Lubricate both o-ring and outer ring to hold in position during assembly of adapter plate. Install adapter plate onto endcover. Make sure o-ring and gerotor ring stay in place.

20 Retain endcover and adapter plate (when used) with four cap screws, Torque 37 to 42 N•m [27 to 31 lbf•ft].

Refer to Appendix B for reassembly of manual servo control assembly.

21 Install control housing gasket onto housing. Install orifices into control assembly and retain in position with petroleum jelly. Position the feedback link at 90 degrees from control housing. Install manual servo control assembly onto housing making sure feedback link entered small groove in servo piston assembly.

22 Retain control assembly with six cap screws, torque 4,5 to 5,4 N•m [40 to 48 lbf•in].

23 Install control arm onto control assembly input arm. Retain with lock washer and nut, torque 5 to 8 N•m [4 to 6 lbf•ft]

24 Install new o-rings on all plugs. Install plugs into housing. Torque 3/4 in. plug 28 to 32 N•m [21 to 24 lbf•ft]. Torque 1-1/4 in. plug 54 to 61 N•m [40 to 45 lbf•ft].

25 Refer to start-up procedures on page 23.

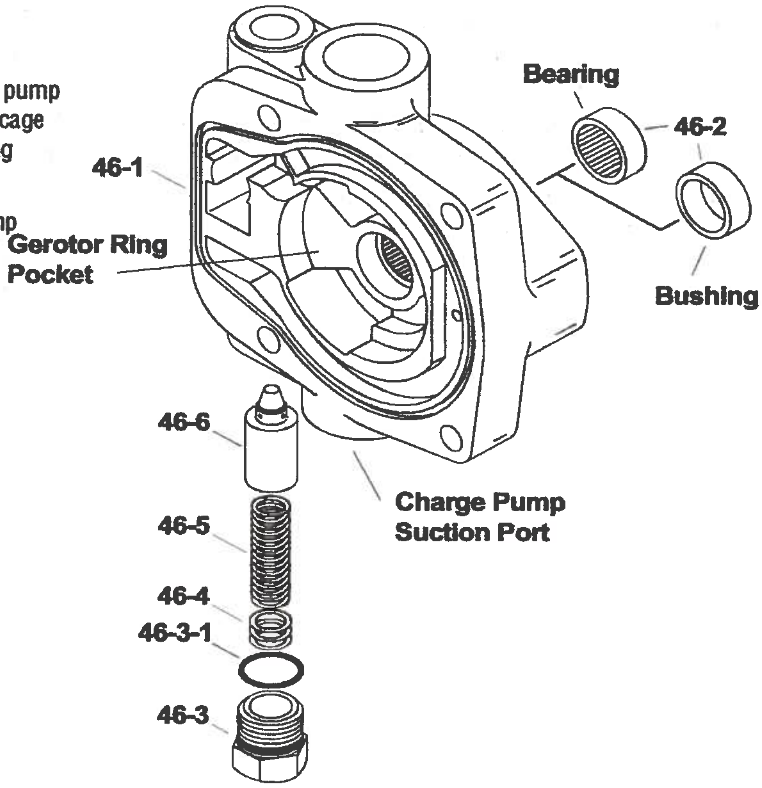
Appendix A - Charge Pump Adapter Assembly

Disassembly - **Charge Pump Adapter Assembly**

1 Remove plug, shims, spring, and poppet from adapter assembly.

Inspection:

- Inspect the charge pump relief valve seat inside the charge pump adapter. Check to insure that seat is smooth and free of burrs or other defects.
- Inspect the charge pump relief valve spring.
- Inspect the bearing or bushing inside the charge pump adapter. The bearing needles must remain in the bearing cage and bearing at dimension shown in figure 1-2. The bushing must have no excessive scoring.
- Inspect the gerotor pocket inside the charge pump adapter assembly. It should not be scored excessively.



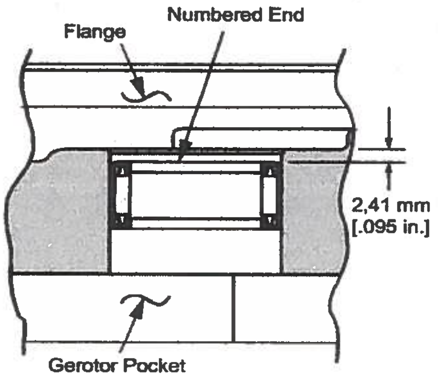


Figure 1-2

Reassembly - **Charge Pump Adapter Assembly**

1 If necessary, press new bearing or bushing in adapter assembly. The bearing to dimension shown in figure 1-2 with the numbered end of bearing outward and closest to mounting flange. The bushing is to be pressed flush to 0,254 mm [.010 in.] recessed.

2 Install poppet, spring, shims, new o-ring on plug, and plug into adapter assembly. Torque plug 40,7 to 36,6 N•m [30 to 27 lbf•ft.]

Item	Qty.	Description
46-1	1	Charge Pump Adapter
46-2	1	Bearing (press fit)
46-2	1	Bushing (press fit)
46-3	1	Plug
+ 46-3-1	1	O-ring
46-4	*f*	Shims
46-5	1	Spring
46-6	1	Poppet

f Shim as required

Appendix B -

Manual Servo Control Basic Assembly

Disassembly - Manual Servo Control Assembly

1 Remove wiper seal with screw driver. Remove set screw retaining input shaft and remove input shaft from control housing.

2 Remove set screw from plug retaining valve spool and remove plug.

3 Remove E-ring from pin retaining feedback link and valve spool. Remove pin, feedback link, valve spool, and bell crank from control housing.

4 Compress spring and remove E-ring, spring retainer, spring, and second spring retainer from valve spool.

5 Remove o-rings from plug and input shaft. Clean all parts and lubricate in prep for reassembly.

Reassembly - Manual Servo Control Assembly

1 Install spring retainer, spring, and second spring retainer onto spool. Compress spring with retainer and retain with E-ring onto valve spool.

2 Install valve spool into control housing making sure that metering notches on valve spool can be seen in the metering ports. Notches shown in figure 2-1.

3 Position bell crank in housing. Slide feedback link into position between clevis on valve spool, aligning holes, and install dowel pin retaining with E-ring.

4 Install new o-ring onto input shaft. Hold bell crank in position with feedback link slot and align splined hole of bell crank with input shaft cavity. Install input shaft into control housing and bell crank.

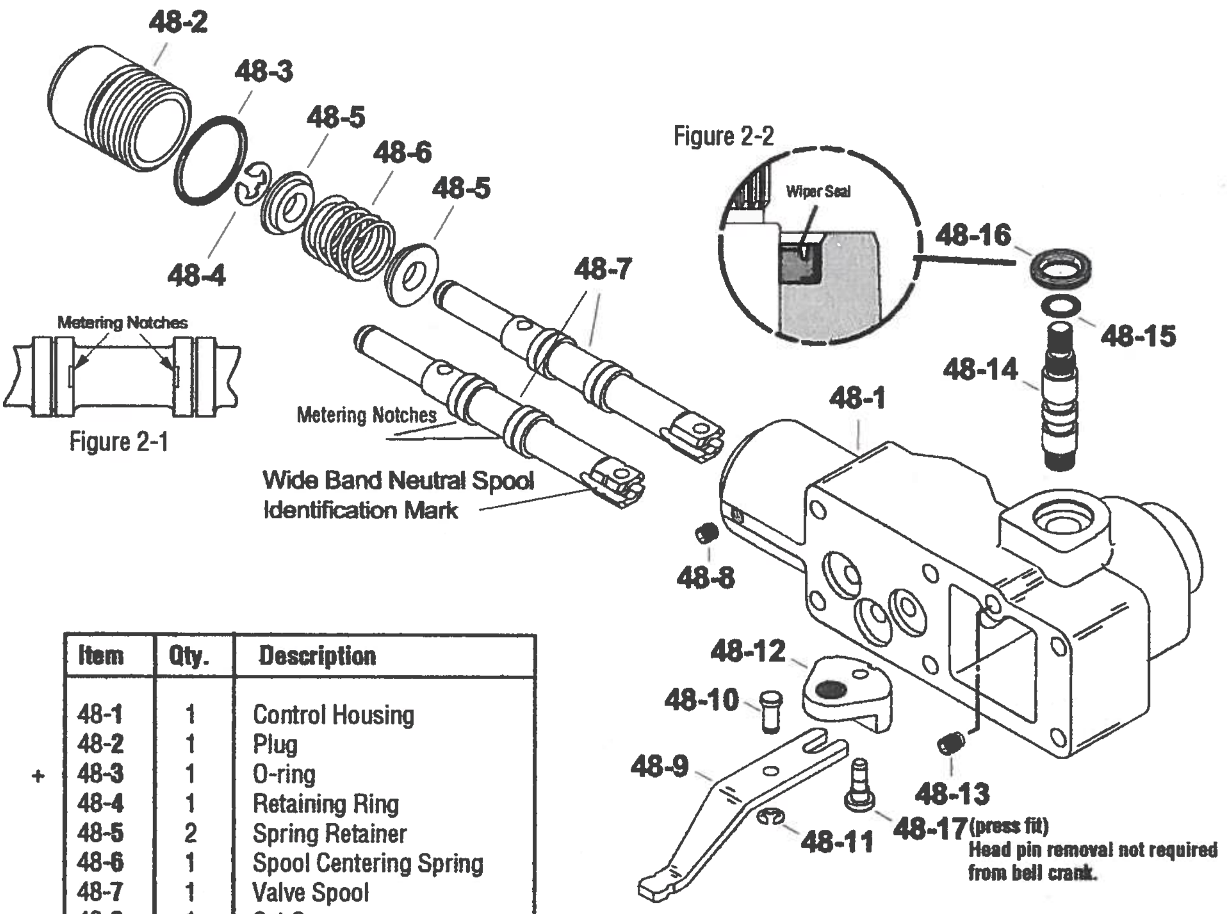
5 Apply Loctite #242 or equivilent to set screw and install, retaining input shaft. Adjust set screw until it bottoms out on input shaft and back out one-quarter turn.

6 Install wiper seal on input shaft as shown in figure 2-2.

7 Install new o-ring onto plug, retaining valve spool, and install plug. Adjust plug until there is no play in the valve spool with input shaft held stationary. Lock in place with set screw. Torque set screw 2 to 3 N•m [17 to 25 lbf•in].

Appendix B -

Manual Servo Control Basic Assembly



	Item	Qty.	Description
	48-1	1	Control Housing
	48-2	1	Plug
+	48-3	1	O-ring
	48-4	1	Retaining Ring
	48-5	2	Spring Retainer
	48-6	1	Spool Centering Spring
	48-7	1	Valve Spool
	48-8	1	Set Screw
	48-9	1	Feedback Link
	48-10	1	Dowel Pin
	48-11	1	Retaining Ring
	48-12	1	Bell Crank
	48-13	1	Set Screw
	48-14	1	Input Shaft
+	48-15	1	O-ring
+	48-16	1	Wiper Seal
	48-17	1	Head Pin (press fit)

Appendix B -

Manual Servo Control Assembly Options

Disassembly - Destroke Valve Assembly Option

1 Remove the two cap screws and lock washers from manifold. Removing destroke valve assembly and two o-rings.

2 Remove destroke valve from manifold in order to remove o-rings and back-up washers. Note: in order to remove destroke valve the solenoid may need to be removed from core first (not shown).

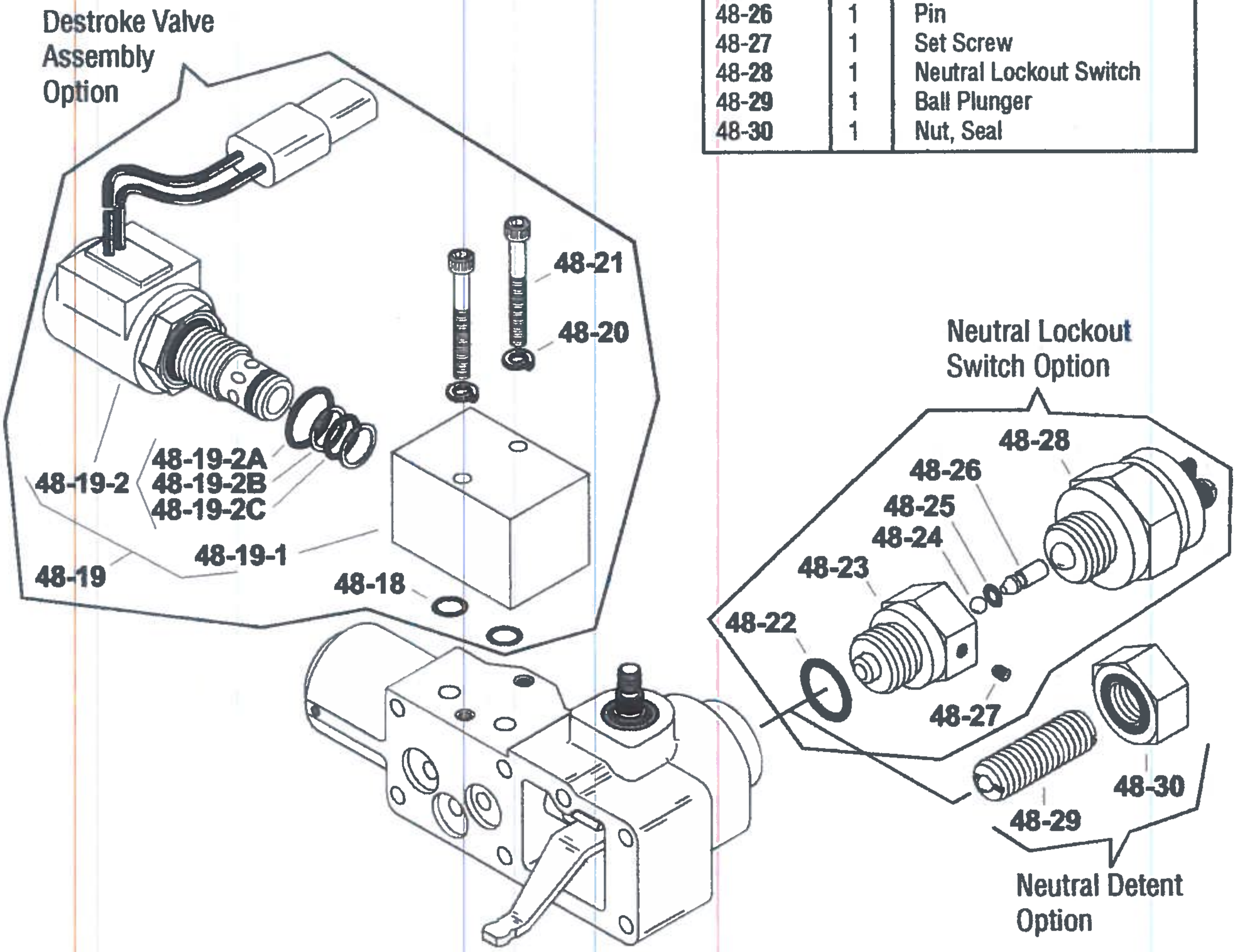
Reassembly - Destroke Valve Assembly Option

1 Install new o-rings and back-up washers onto destroke valve.

2 Install destroke valve into manifold by hand until top o-ring is met by manifold. Then wrench tighten to 34 N•m [25 lbf•ft.] max. Loosen Nut retaining coil to reposition if necessary and re-torque 5,4 to 7 N•m [4 to 5 lbf•ft.].

3 Lubricate the two o-rings and install onto manifold. Install destroke valve assembly onto control assembly. Retain with lock washers and cap screws. Torque 3 to 3,5 N•m [27 to 31 lbf•in.].

Item	Qty.	Description
48-18	2	O-ring
48-19	1	Destroke Valve Assy.
48-19-1	1	Manifold
48-19-2	1	Destroke Valve
48-19-2A	1	O-ring
48-19-2B	2	Back-up Washer
48-19-2C	1	O-ring
48-20	2	Lock Washer
48-21	2	Cap Screw
48-22	1	O-ring
48-23	1	Adapter, Neutral Lockout
48-24	1	Ball
48-25	1	O-ring
48-26	1	Pin
48-27	1	Set Screw
48-28	1	Neutral Lockout Switch
48-29	1	Ball Plunger
48-30	1	Nut, Seal



Appendix B -

Manual Servo Control Assembly Options

Disassembly - Neutral Lockout Switch Assembly Option

1 Loosen set screw in adapter and remove neutral lockout switch from adapter.

2 Remove neutral lockout adapter from control assembly.

3 Remove pin, ball, and o-rings from adapter.

Reassembly - Neutral Lockout Switch Assembly Option

1 Install new o-ring onto adapter and new o-ring onto pin.

2 Install ball and pin into adapter. Lubricate with petroleum jelly to hold in place during installation.

3 Install adapter into control assembly. Torque 60 to 70 N•m [44 to 53 lbf•ft].

4 Apply Loctite #222 or equivalent to threads of switch and install neutral lockout switch into adapter. The adjustment procedures for the switch are as follows.

a) Install switch, while moving control arm back and forth, until "detent" action is detected. Back out the switch until the "detent" action is very slight.

b) Obtain a test light or use a multimeter. Attach the leads from the test light to the switch or the wiring connector.

c) Move the control arm out of the detent position. The test light will go on. Screw in the switch until the light goes off. Mark this as position "A". See figure 2-3. Move the control arm to the detent position and the test light should come back on.

d) Leaving the control arm in the detent position, the light will remain on. Screw in the switch until the light goes off. Mark this position"B".

e) Unscrew the switch one third of the distance between "B" and "A". Install and tighten the hex socket head set screw in one of the upper quadrants of the hex of the switch adapter. See figure 2-3. Torque set screw 3.2 to 3.8 N•m [28 to 34 lbf•in.]

5 Test the switch by moving the control arm to the detent position, the light should be on. Move the control arm out of detent, the light should go off.

6 Remove test light and put servo control assembly into operation.

Disassembly - Neutral Detent Option

1 Loosen seal nut and remove ball plunger from control housing.

Reassembly - Neutral Detent Option

1 Install ball plunger into control housing until contact with bell crank detent is detected. After contact, screw in 1/2 turn and retain with seal nut. Torque nut 14 to 30 N•m [10 to 22 lbf•ft].

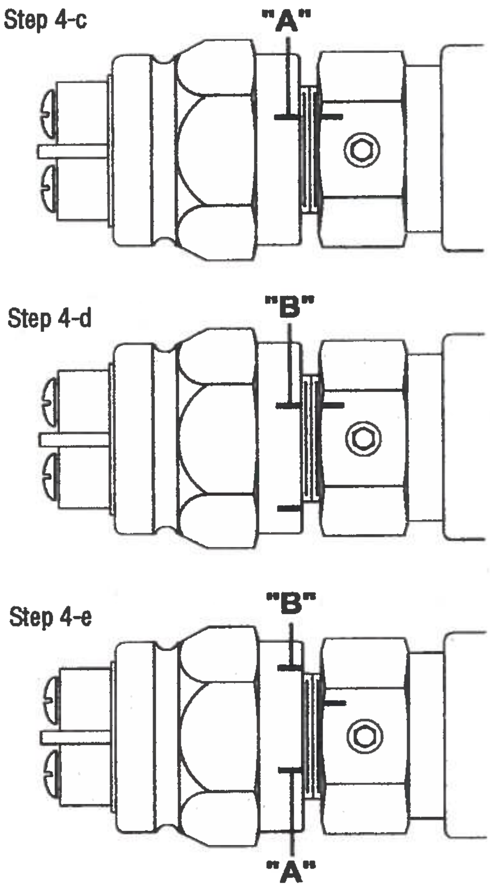


Figure 2-3

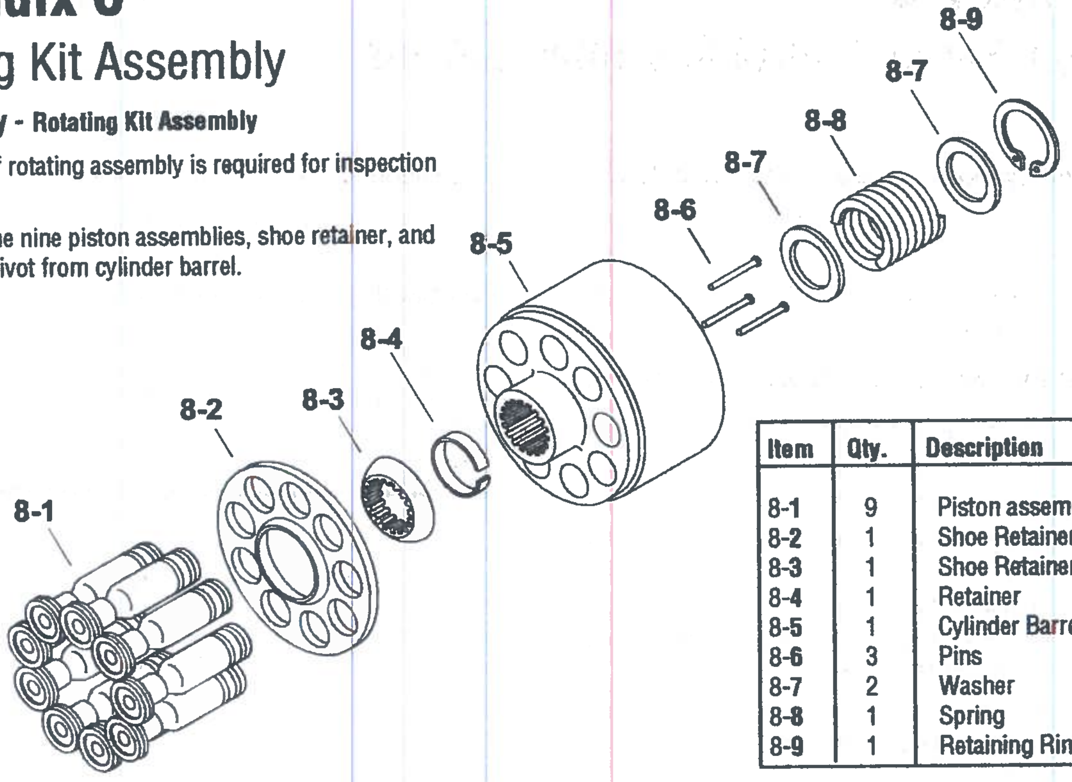
Appendix C -

Rotating Kit Assembly

Disassembly - Rotating Kit Assembly

Disassembly of rotating assembly is required for inspection only.

1 Remove the nine piston assemblies, shoe retainer, and shoe retainer pivot from cylinder barrel.



Item	Qty.	Description
8-1	9	Piston assemblies
8-2	1	Shoe Retainer
8-3	1	Shoe Retainer Pivot
8-4	1	Retainer
8-5	1	Cylinder Barrel
8-6	3	Pins
8-7	2	Washer
8-8	1	Spring
8-9	1	Retaining Ring

Inspection:

- Examine the O.D. of the pistons for finish condition. They should not show wear or deep scratches. Inspect the shoes for a snug fit on the ball end of the pistons and a flat smooth surface that comes in contact with the swashplate. **Do not lap piston shoes.**
- Examine the shoe retainer for wear in the pivot area.
- Examine the pivot to insure smoothness and no signs of wear.
- Inspect the cylinder barrel surface that makes contact with valve plate. This surface should be smooth and free of deep scratches. **Do not lap piston block.**
- The pistons should move freely in the cylinder barrel bore. If they are sticky in the bore, examine the bore for scoring or contamination.

2 To inspect pins and spring **caution** should be taken in removing spring. The **spring is highly compressed** and the retaining ring should not be removed without compressing the spring safely.

The following parts are required to disassemble the cylinder barrel:

2 ea.	3/8 in. I.D. x 1-1/8 in. O.D. flat washers
1 ea.	3/8 in. x 3-1/4 in. N.C. cap screw, and
1 ea.	3/8 in. N.C. nut

To remove spring, place one of the flat washers over the 3/8 in. x 3-1/4 in. cap screw. Put cap screw through the center of the cylinder barrel and apply the second washer. Let washer rest on the three pins and retain with nut. Turning nut and compressing spring inside the barrel. Use a pair of retaining ring pliers and remove the internal retaining ring. Remove nut, bolt, and the two washers from barrel. Remove the washer, spring, second washer, three pins, and pin keeper at the same time.

Reassembly - Rotating Kit Assembly

1 To reassemble the rotating kit assembly complete the following: Compress the pin keeper and install in the spline of the cylinder barrel. Install the three pins with head end to the inside of the barrel and position in the special grooves of the cylinder barrel spline.

2 Install the washer, spring, and second washer into the cylinder barrel. Use the two 3/8 in. I.D. washers, nut, and 3/8 in. x 3-1/4 in. cap screw to compress the spring and retain with retaining ring. Remove the nut, cap screw, and the two washers.

3 Install the pivot onto the three pins, shoe retainer on the pivot, and piston assemblies thru the shoe retainer and into cylinder barrel, resting on shoe retainer.

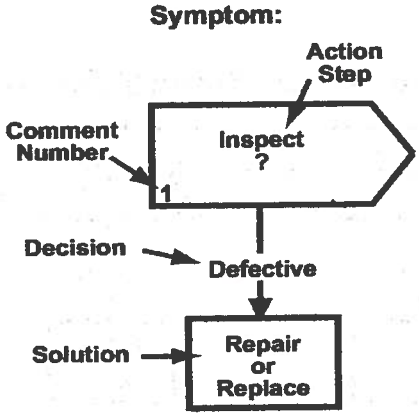
Fault - Logic Trouble Shooting

This fault - logic trouble shooting guide is a diagnostic aid in locating transmission problems.

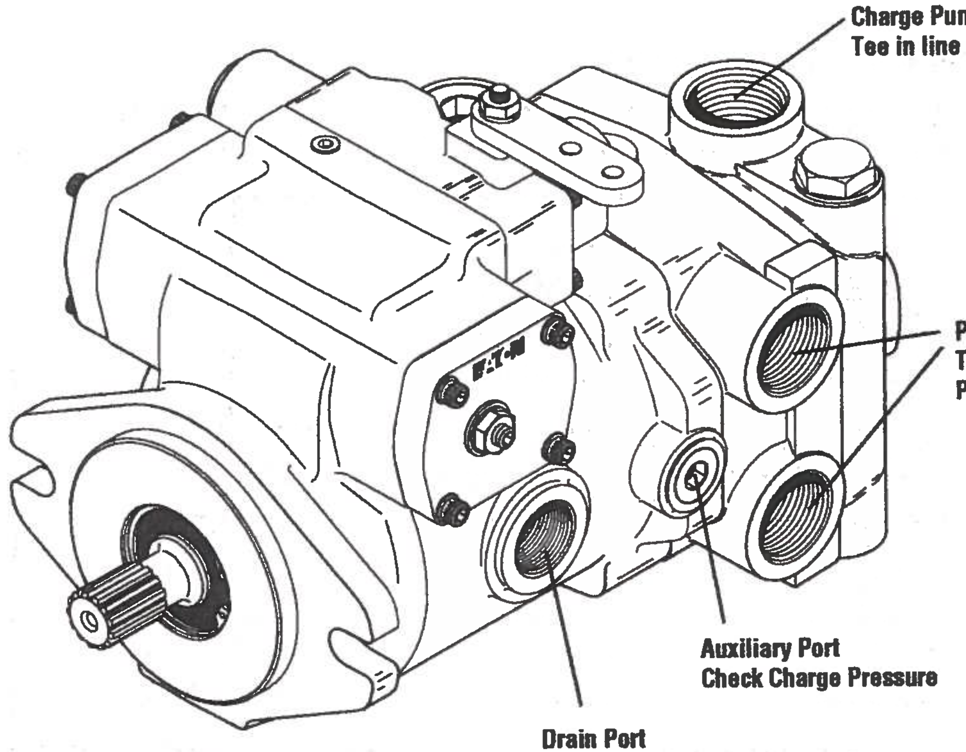
Match the transmission symptoms with the problem statements and follow the action steps shown in the box diagrams. This will give expedient aid in correcting minor problems eliminating unnecessary machine down time.

Following the fault - logic diagrams are diagram action comments of the action steps shown in the diagrams. Where applicable, the comment number of the statement appears in the action block of the diagrams.

Explanatory Diagram



Recommended Gauge Locations



Charge Pump Suction Port
Tee in line to check Inlet Vacuum

Pressure Ports
Tee in line to check System Pressure

Auxiliary Port
Check Charge Pressure

Drain Port
Tee in line to check Case Pressure

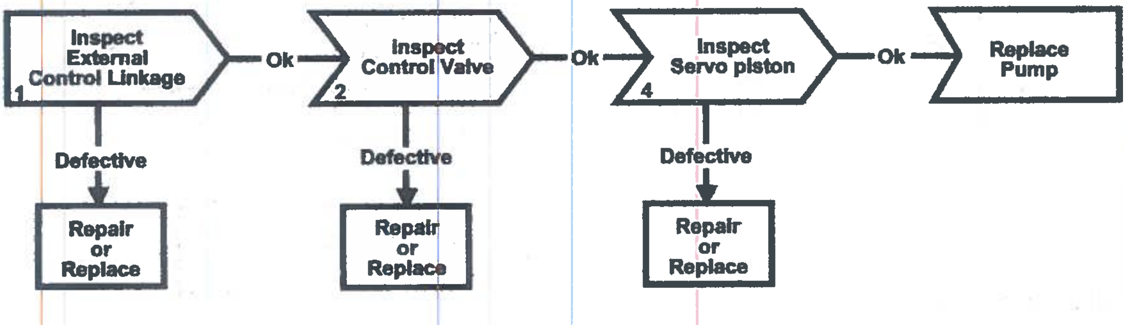
Figure 3-1

Gauges Recommended

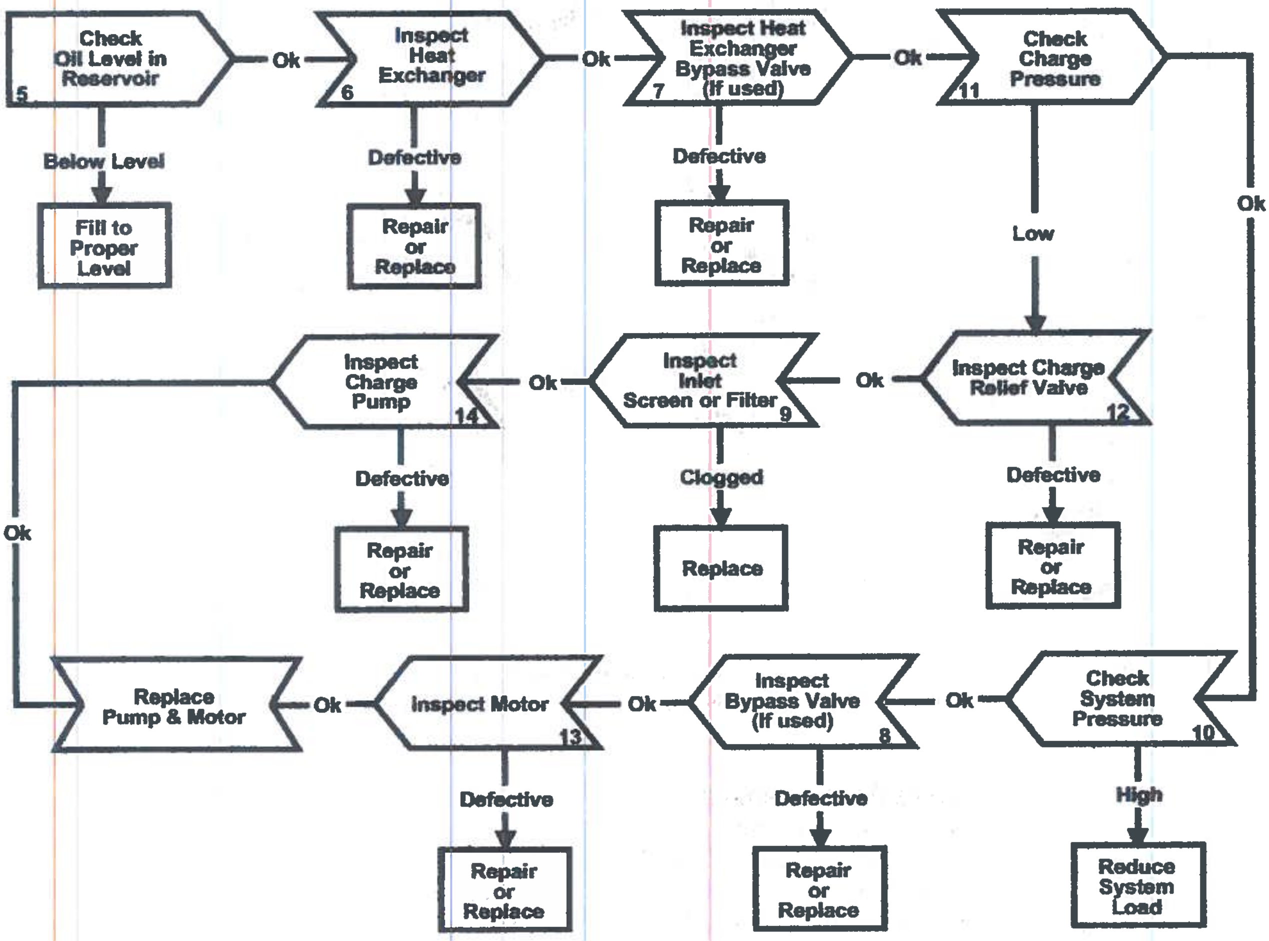
Inlet vacuum gauge: 2 bar to 1 bar [30 PSI to 30 inHg]
System pressure gauge: 700 bar [10,000 PSI]
Charge pressure gauge: 0 to 50 bar [0 to 600 PSI]
Case pressure gauge: 0 to 25 bar [0 to 300 PSI]

Fault - Logic Trouble Shooting

Symptom: Neutral Difficult or Impossible to Find

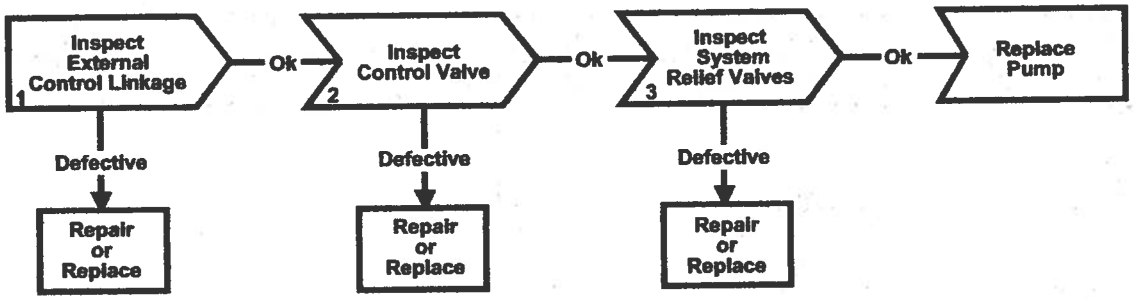


Symptom: System Operating Hot

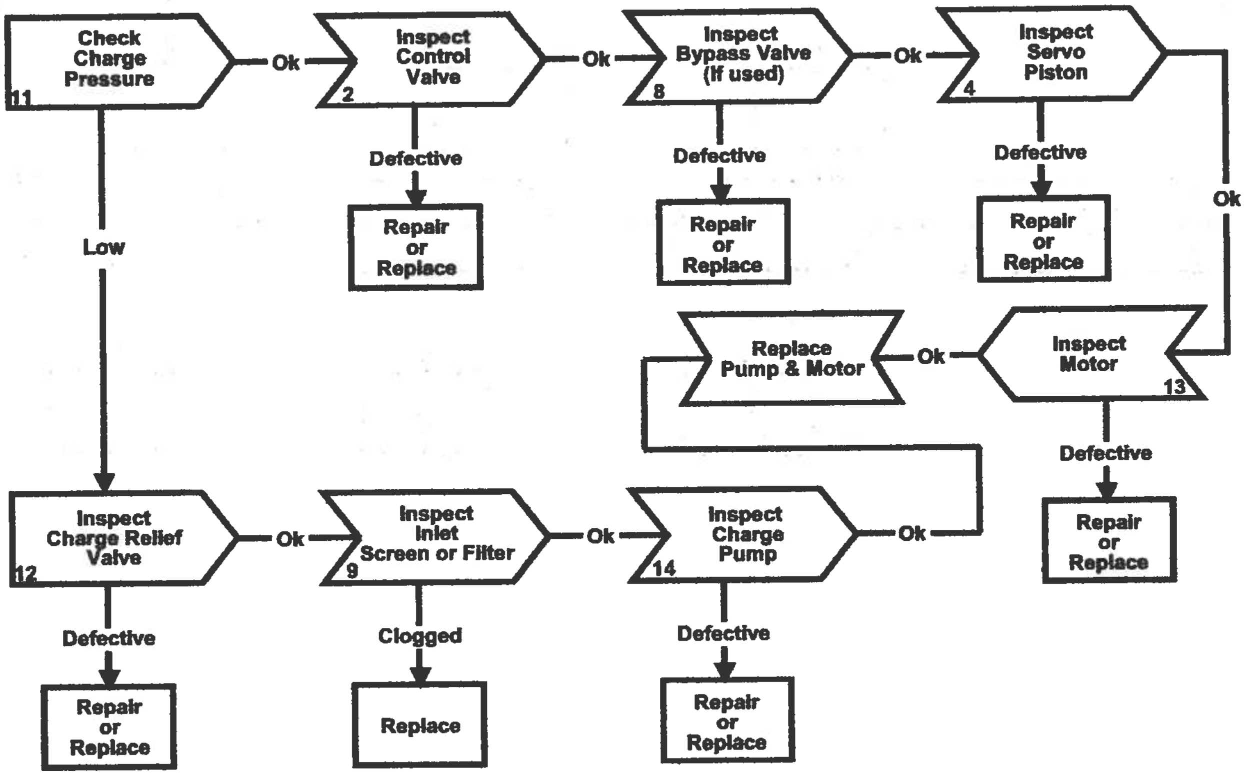


Fault - Logic Trouble Shooting

Symptom: Operates in One Direction Only

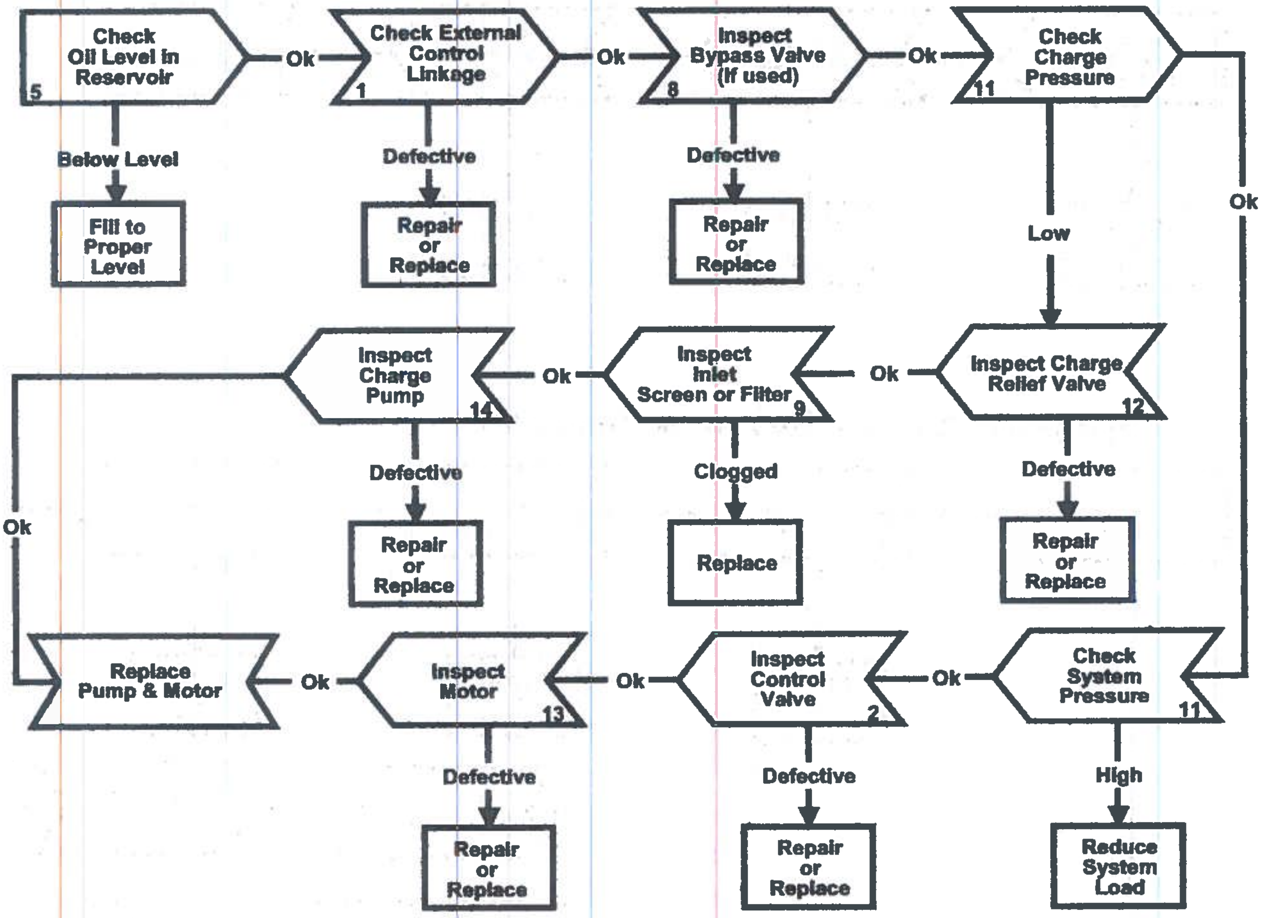


Symptom: System Response Sluggish



Fault - Logic
Trouble Shooting

Symptom: System Will Not Operate in Either Direction



Fault - Logic Trouble Shooting

Diagram Action Step Comments

1 **Inspect External Control Linkage for:**
- a. misadjusted or disconnected
- b. binding, bent, or broken

2 **Inspect Control Valve for:**
- a. plugged control orifice(s)
- b. damaged mounting gasket
- c. misadjusted, damaged or broken neutral return spring
- d. broken control connector pin
- e. faulty destroke valve (if used)
- f. galled or stuck control spool
- g. neutral detent or lockout switch misadjusted (if used)

3 **Inspect System Relief Valves * for:**
- a. improper pressure relief setting
- b. damaged or broken spring
- c. valve held off seat
- d. damaged valve seat

4 **Inspect Servo Piston for:**
- a. misadjusted, damaged or broken neutral return spring assembly
- b. galled or stuck servo piston
- c. damaged or missing o-ring and/or back-up ring

5 **Check Oil Level in Reservoir:**
- a. consult owner/operators manual for the proper type fluid and level

6 **Inspect Heat Exchanger for:**
- a. obstructed air flow (air cooled)
- b. obstructed water flow (water cooled)
- c. improper plumbing (inlet to outlet)
- d. obstructed fluid flow

7 **Inspect Heat Exchanger Bypass Valve for:**
- a. improper pressure adjustment
- b. stuck or broken valve

8 **Inspect Bypass Valve for: (if used)**
- a. held in a partial or full open position

9 **Inspect Inlet Screen or Filter for:**
- a. plugged or clogged screen or filter element
- b. obstructed inlet or outlet
- c. open inlet to charge pump

10 **Check System Pressure:**
- a. See figure 3-1 for location of pressure gauge installation
- b. consult owner/operators manual for maximum system relief valve settings

11 **Check Charge Pressure:**
- a. See figure 3-1 for location of charge pressure gauge installation
- b. consult owner/operators manual for maximum charge relief valve settings

12 **Inspect Charge Relief Valve for:**
- a. improper charge relief pressure setting *
- b. damaged or broken spring
- c. poppet valve held off seat

13 **Inspect Motor for:**
- a. consult owner/operator manual for motor operation and trouble shooting

14 **Inspect Charge Pump for:**
- a. broken or missing drive key
- b. damaged or missing o-ring
- c. excessive gerotor clearance
- d. galled or broken gerotor set

*** System/Charge Relief Valve Pressure Settings**

Inlet Vacuum	0,203 bar [6 inHg] max.
Case Pressure	1,7 bar [25 PSI] maximum
Charge Pressure	17,24 to 20,68 bar [250 to 300 PSI]
System Pressure	345 bar [5000 PSI] maximum 207 bar [3000 PSI] continuous

The high pressure relief valves are all factory preset and cannot be readjusted.

The pressure setting is stamped on each valve with a three digit number. To identify, multiply the noted number by 10 to get the valves pressure setting.
Example: 10 x 500 = [5000 PSI] 345 bar

Start-up Procedure

When initially starting a new or a rebuilt transmission system, it is extremely important that the start-up procedure be followed. It prevents the chance of damaging the unit which might occur if the system was not properly purged of air before start-up.

1 After the transmission components have been properly installed, fill the servo pump housing at least half full with filtered system oil. Connect all hydraulic lines and check to be sure they are tight.

2 Install and adjust all control linkage.

3 Fill the reservoir with an approved oil that has been filtered through a 10 micron filter. Refer to Eaton Hydraulics Technical Data sheet number 3-401 titled Hydraulic Fluid Recommendations.

4 Gasoline or L.P. engines: remove the coil wire and turn the engine over for 15 seconds. Diesel engines: shut off the fuel flow to the injectors and turn the engine over for 15 seconds.

5 Replace the coil wire or return the fuel flow to the injectors. Place the transmission unit in the neutral position, start the engine and run it at a low idle. The charge pump should immediately pick up oil and fill the system. If there is no indication of fill in 30 seconds, stop engine and determine the cause.

6 After the system starts to show signs of fill, slowly move pump swashplate to a slight cam angle. Continue to operate system slowly with no load on motors until system responds fully.

7 Check fluid level in the reservoir and refill if necessary to the proper level with an approved filtered oil.

8 Check all line connections for leaks and tighten if necessary.

9 The machine is now ready to be put into operation.

10 Frequent filter changes are recommended for the first two changes after placing the machine back into operation. Change the first filter in 3-5 hours and the second at approximately 50 hours approx. hours. Routinely scheduled filter changes are recommended for maximum life of the hydraulic system.

Notes

Order parts from number 06-06-642 Parts Information booklet.
Each order must include the following information.

1. Product and/or Part Number
2. Serial Code Number
3. Part Name
4. Quantity

Eaton Hydraulics
15151 Highway 5
Eden Prairie, MN 55344
Telephone: 952 937-7254
Fax: 952 937-7130
www.eatonhydraulics.com

46 New Lane, Havant
Hampshire PO9 2NB
England
Telephone: (44) 170-548-6451
Fax: (44) 170-548-7110

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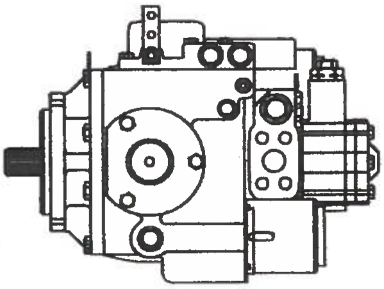
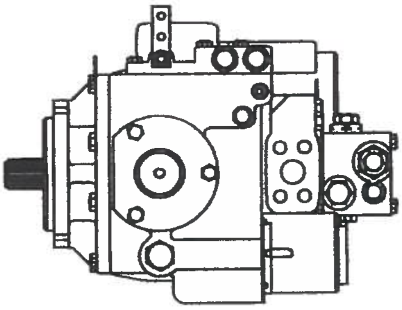
Heavy Duty Hydrostatic Transmissions

No. 7-404
July, 1995

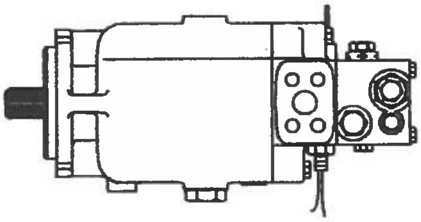
Variable Displacement Pump



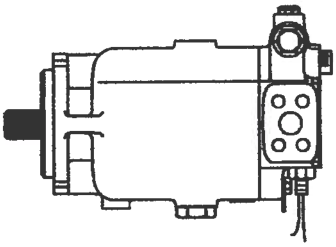
Variable Displacement Motor



Fixed Displacement Motor



Fixed Displacement Motor
(With Integral Shuttle)



Troubleshooting Guide for Eaton Hydrostatic Transmissions

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Introduction

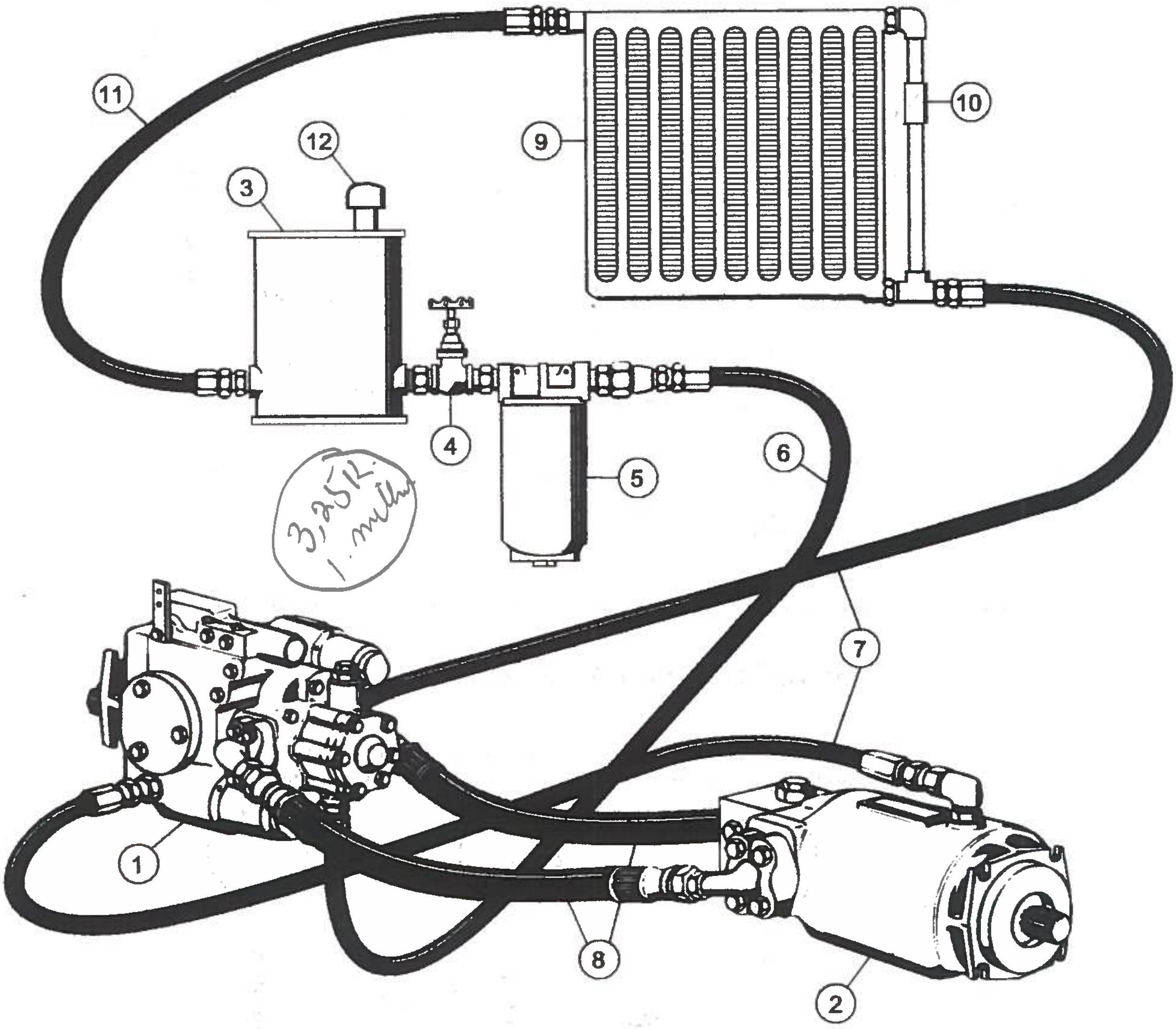
This manual provides troubleshooting information for a typical hydrostatic system. It will help you to diagnose minor problems that may occur with Eaton Heavy Duty Hydrostatic Transmissions.

The following publications are also available for Eaton Heavy Duty Hydrostatic Transmissions:

Technical Data for Hydrostatic Closed-Circuit Schematics	No. 3-403
Eaton Heavy Duty Hydrostatic Start-Up Procedure	No. 2-402
Eaton Hydrostatic Variable Pump Repair Manual (Series 0)	No. 7-603
Eaton Hydrostatic Variable Pump Repair Manual (Series 1)	No. 7-606
Eaton Hydrostatic Fixed Pump Repair Manual (Series 0)	No. 7-122
Eaton Hydrostatic Fixed Pump Repair Manual (Series 1)	No. 7-127
Eaton Hydrostatic Variable Motor Repair Manual (Series 0)	No. 7-121
Eaton Hydrostatic Variable Motor Repair Manual (Series 1)	No. 7-140

Typical Hydrostatic System

Variable Pump-Fixed Motor

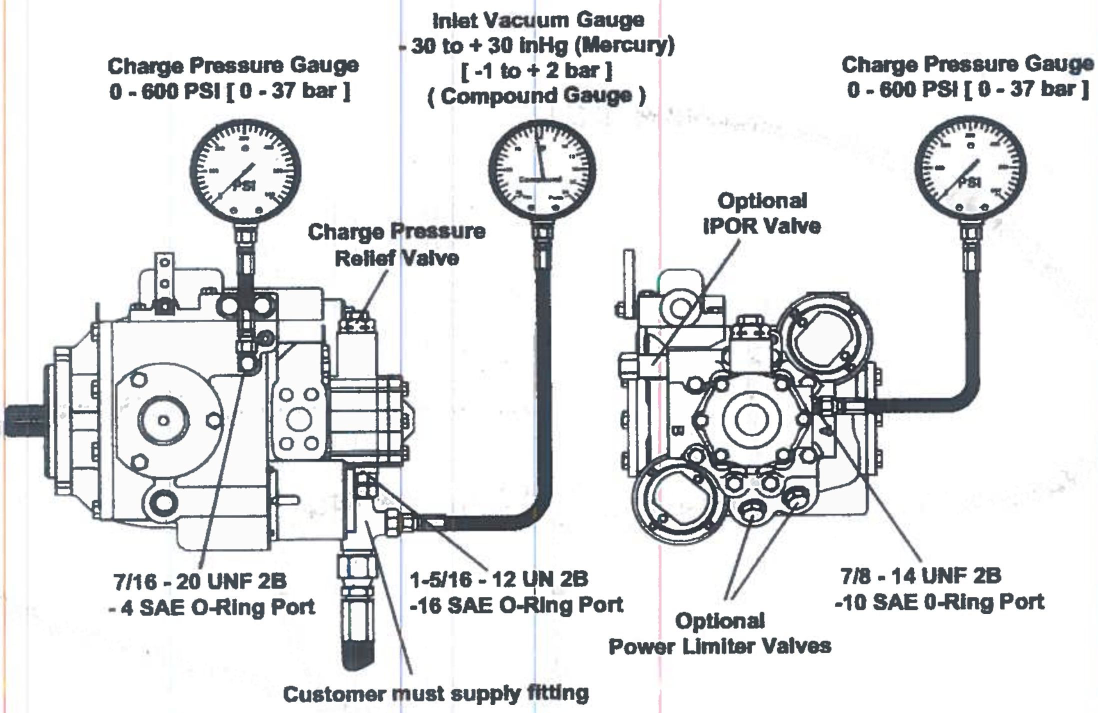


3,25 kr.
1. mill

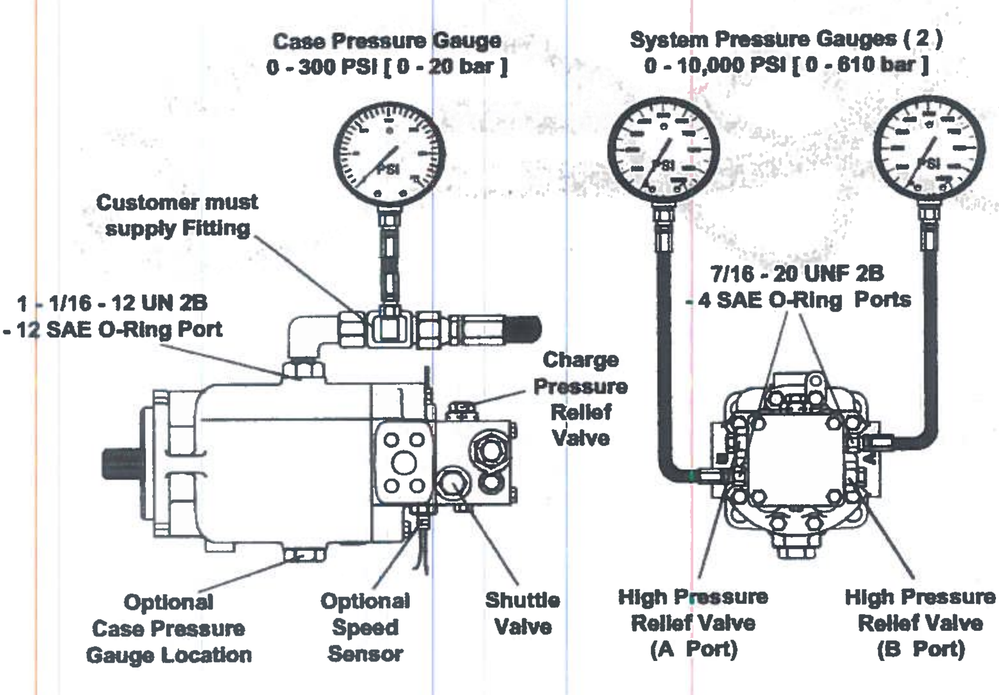
1 Variable Displacement Pump
2 Fixed or Variable Displacement Motor
3 Reservoir
4 Shut-off Valve (Optional)
5 Filter
6 Charge Pump Inlet Line
7 Pump and Motor Case Drain Lines
8 High Pressure Lines
9 Heat Exchanger
10 Heat Exchanger By-pass Valve
11 Reservoir Return Line
12 Reservoir fill Cap and Breather

Gauge Requirements, Gauge Port Size and Locations

Variable Displacement Pumps

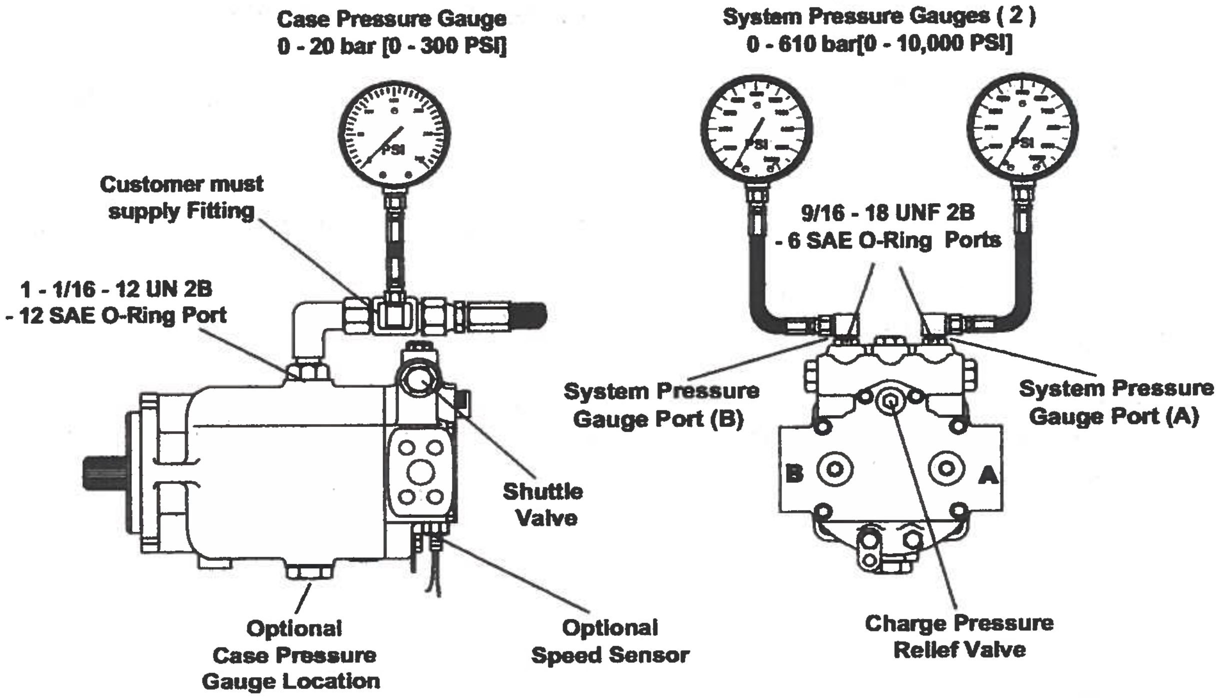


Fixed Displacement Motors

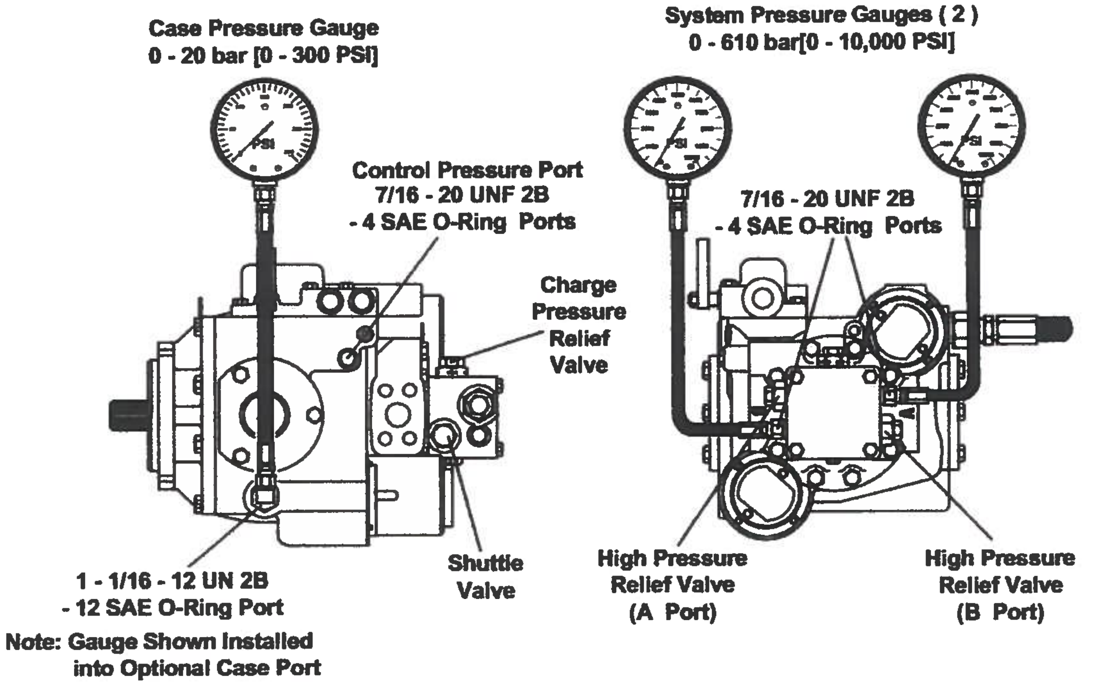


Gauge Requirements, Gauge Port Size and Locations

Fixed Displacement Motors
(with Integral Shuttle)


Case Pressure Gauge
0 - 20 bar [0 - 300 PSI]
System Pressure Gauges (2)
0 - 610 bar[0 - 10,000 PSI]
PSI
Customer must supply Fitting
9/16 - 18 UNF 2B
- 6 SAE O-Ring Ports
1 - 1/16 - 12 UN 2B
- 12 SAE O-Ring Port
System Pressure Gauge Port (B)
System Pressure Gauge Port (A)
B
A
Shuttle Valve
Optional Case Pressure Gauge Location
Optional Speed Sensor
Charge Pressure Relief Valve

Variable Displacement Motors


Case Pressure Gauge
0 - 20 bar [0 - 300 PSI]
System Pressure Gauges (2)
0 - 610 bar[0 - 10,000 PSI]
PSI
Control Pressure Port
7/16 - 20 UNF 2B
- 4 SAE O-Ring Ports
7/16 - 20 UNF 2B
- 4 SAE O-Ring Ports
Charge Pressure Relief Valve
1 - 1/16 - 12 UN 2B
- 12 SAE O-Ring Port
Note: Gauge Shown Installed into Optional Case Port
Shuttle Valve
High Pressure Relief Valve (A Port)
High Pressure Relief Valve (B Port)

Note: To protect your instrumentation, all gauges should be dampened (or snubbed) and mounted with flexible lines.

Pressure Readings

The pressures given in this manual are gauge pressures or delta pressures. A pressure gauge reads zero when connected to atmospheric pressure. Any reading above or below this zero point is referred to as gauge pressure (bar [PSI]). Delta pressure is the difference of two gauge pressures in a hydraulic circuit.

Example:

Charge pressure reading of 16,5 bar [240 PSI]
- Case pressure reading of 1,5 bar [20 PSI]

Differential pressure of 15,0 D bar [220 D PSI]

Typical hydrostatic circuits usually include a inlet pressure, case pressure, low or charge pressure and system or high pressure. These pressures will vary per each individual application and operating conditions.

Nominal Operating Pressures

(At Normal Operating Temperature)

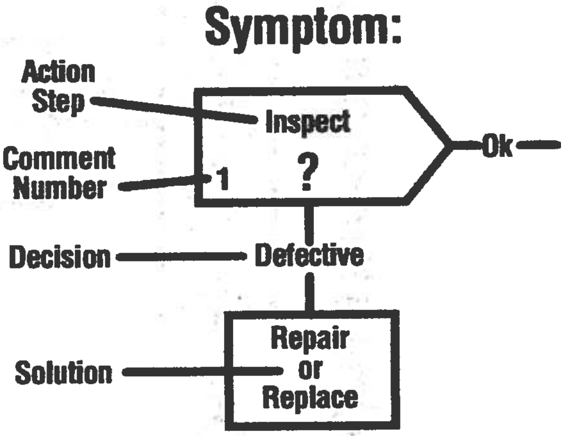
Inlet Vacuum:	Should not exceed 254 mm [10 in.] mercury (Hg.) for an extended period of time	
Case pressure:	Should not exceed 2,8 bar [40 PSI] for an extended period of time	
Charge Pressure:*	Neutral	15,2 bar [220 PSI]
	Forward or Reverse	11,0 bar [160 PSI]

*Charge Pressure Relief valves are factory preset to their nominal setting with a 7,6 l/min [2 GPM] flow rate. The original valve pressure will increase approximately ,45 bar per 3,8 l/min [6.5 PSI per 1 GPM] additional flow over the valve. The charge pressures given above are typical. Higher charge pressures may be set at the factory for your particular application.

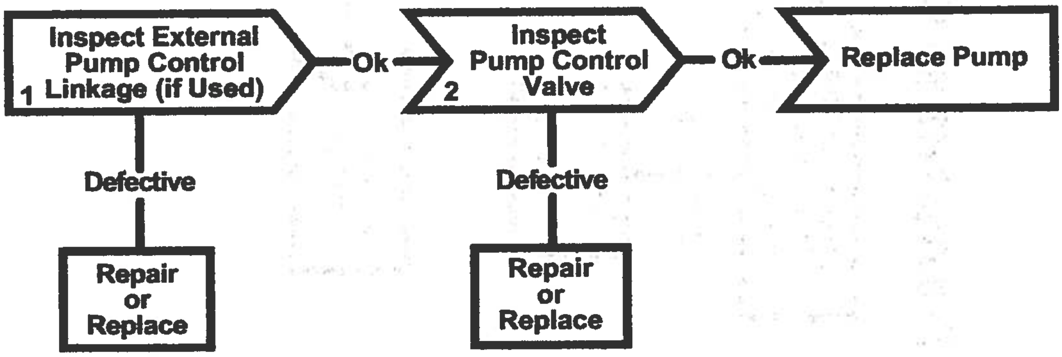
Fault-Logic Troubleshooting

This guide is designed as a diagnostic aid for the user to locate possible transmission problems. Match the transmission symptoms with the problem statements and follow the action steps shown in the box diagrams. This will help in correcting minor problems, eliminating unnecessary mixer down time.

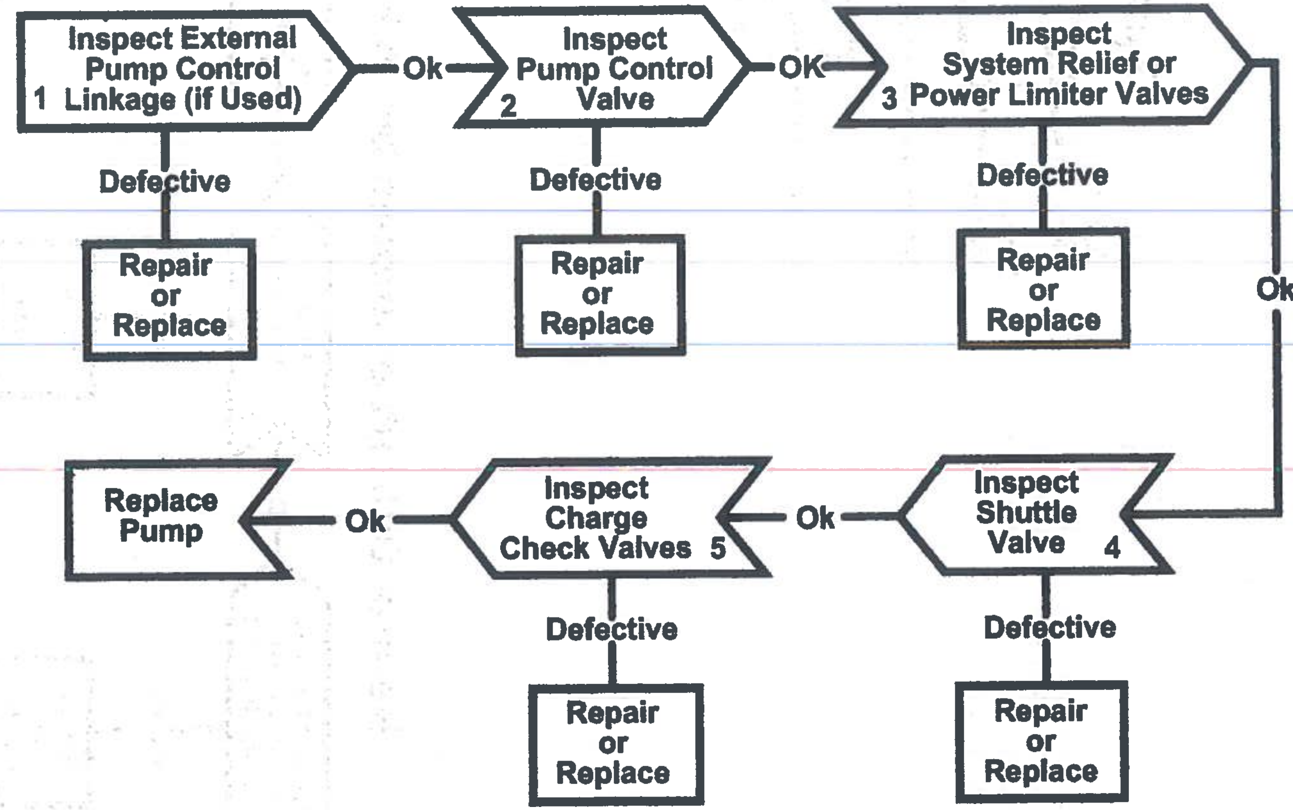
Following the fault-logic diagrams are diagram action comments to further help explain the action steps shown in the diagrams. Where applicable, the action comment number of the statement appears in the action block of the diagram.



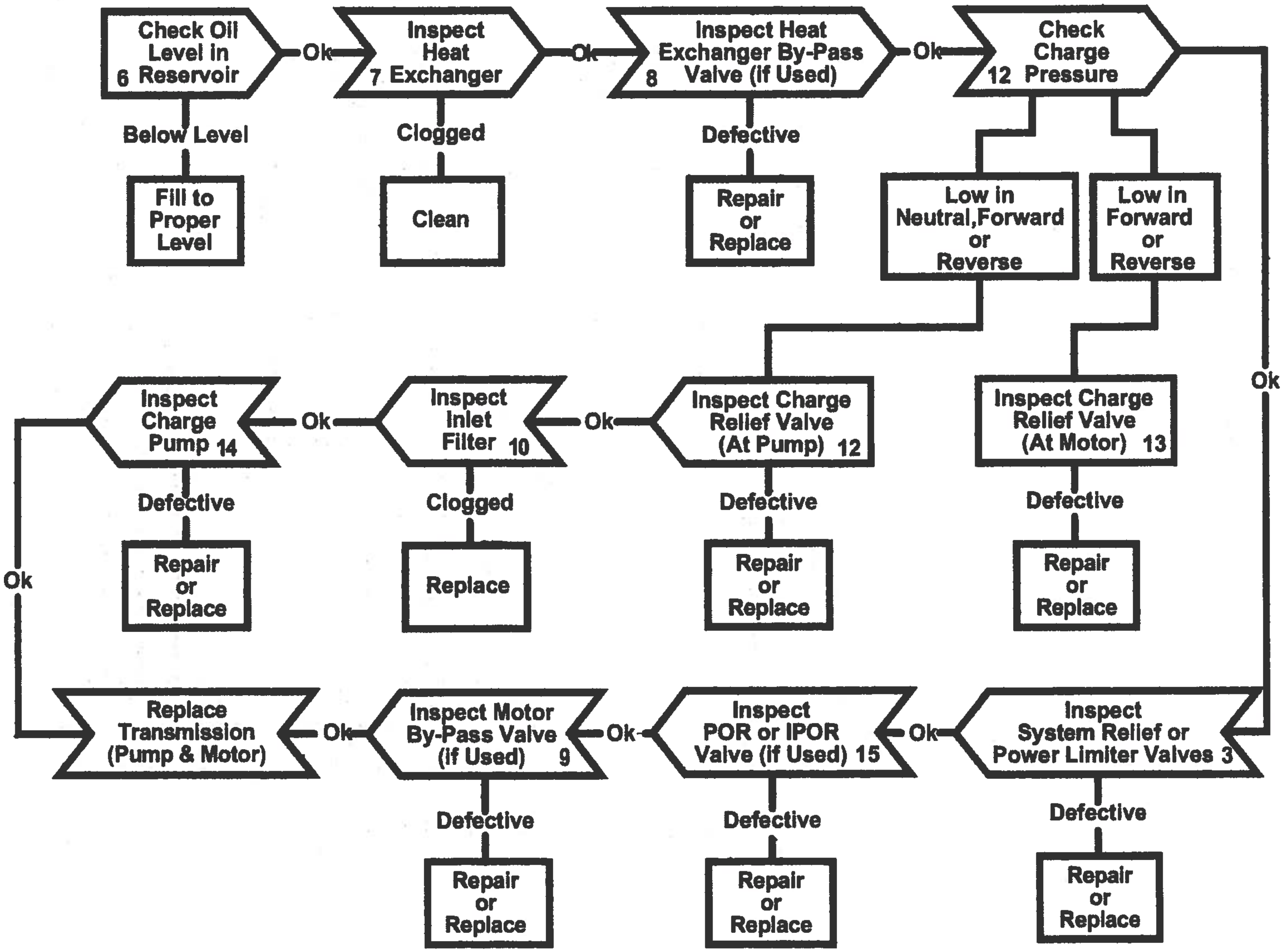
Neutral Difficult or Impossible to Find


Inspect External Pump Control Linkage (if Used)
1
Ok
Inspect Pump Control Valve
2
Ok
Replace Pump
Defective
Repair or Replace
Defective
Repair or Replace

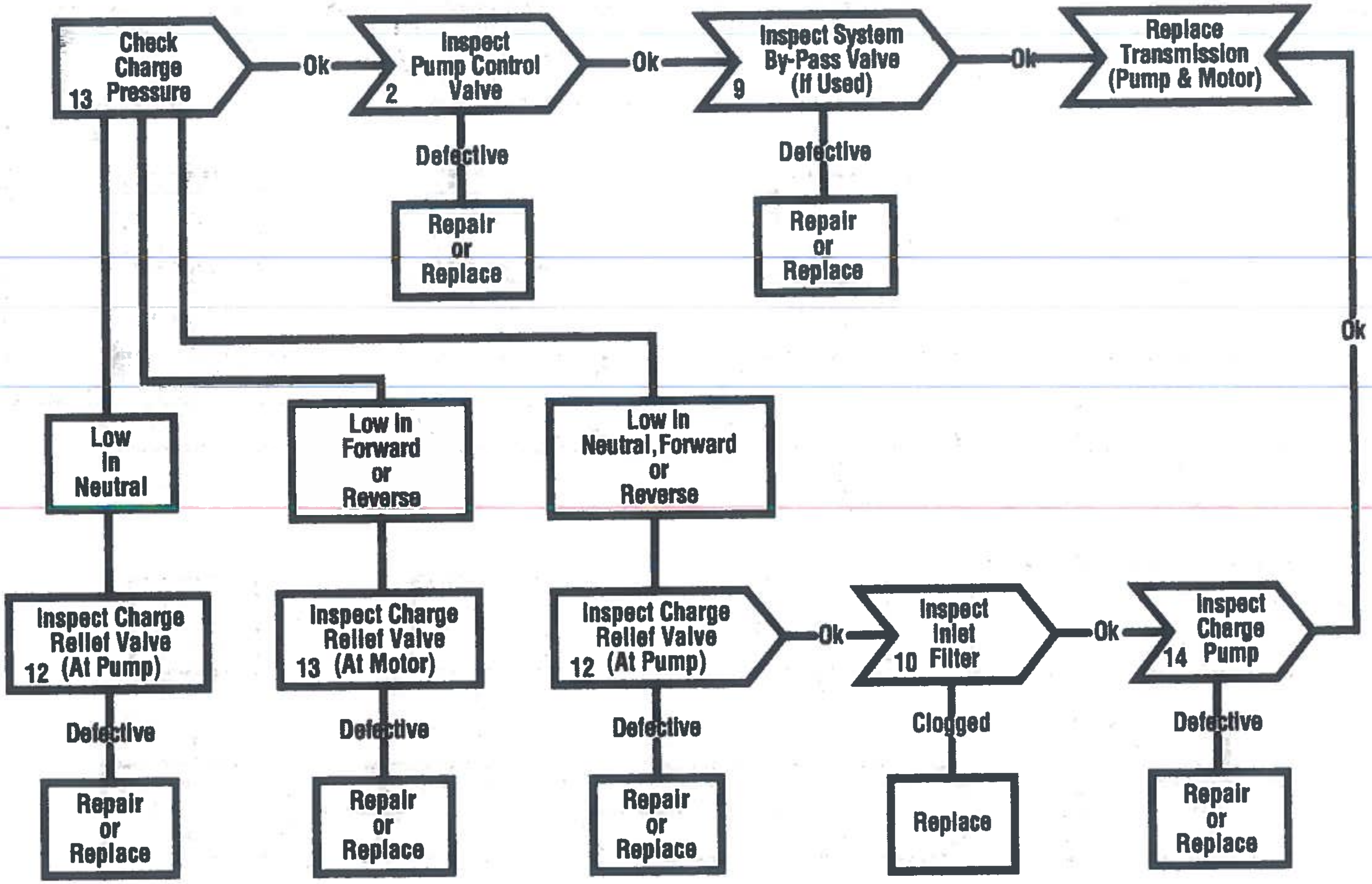
Transmission Operates in One Direction Only



System Operating Hot


Check Oil Level in Reservoir 6
Below Level
Fill to Proper Level
Ok
Inspect Heat Exchanger 7
Clogged
Clean
Ok
Inspect Heat Exchanger By-Pass Valve (if Used) 8
Defective
Repair or Replace
Ok
Check Charge Pressure 12
Low in Neutral,Forward or Reverse
Low in Forward or Reverse
Ok
Inspect Charge Relief Valve (At Pump) 12
Defective
Repair or Replace
Inspect Charge Relief Valve (At Motor) 13
Defective
Repair or Replace
Ok
Inspect Inlet Filter 10
Clogged
Replace
Ok
Inspect Charge Pump 14
Defective
Repair or Replace
Ok
Inspect System Relief or Power Limiter Valves 3
Defective
Repair or Replace
Ok
Inspect POR or IPOR Valve (if Used) 15
Defective
Repair or Replace
Ok
Inspect Motor By-Pass Valve (if Used) 9
Defective
Repair or Replace
Ok
Replace Transmission (Pump & Motor)

System Response Sluggish


Check Charge Pressure
13
Ok
Inspect Pump Control Valve
2
Ok
Inspect System By-Pass Valve (If Used)
9
Ok
Replace Transmission (Pump & Motor)
Defective
Repair or Replace
Defective
Repair or Replace
Low In Neutral
Low In Forward or Reverse
Low In Neutral, Forward or Reverse
Inspect Charge Relief Valve (At Pump)
12
Defective
Repair or Replace
Inspect Charge Relief Valve (At Motor)
13
Defective
Repair or Replace
Inspect Charge Relief Valve (At Pump)
12
Defective
Repair or Replace
Ok
Inspect Inlet Filter
10
Clogged
Replace
Ok
Inspect Charge Pump
14
Defective
Repair or Replace
Ok

System Will Not Operate in Either Direction

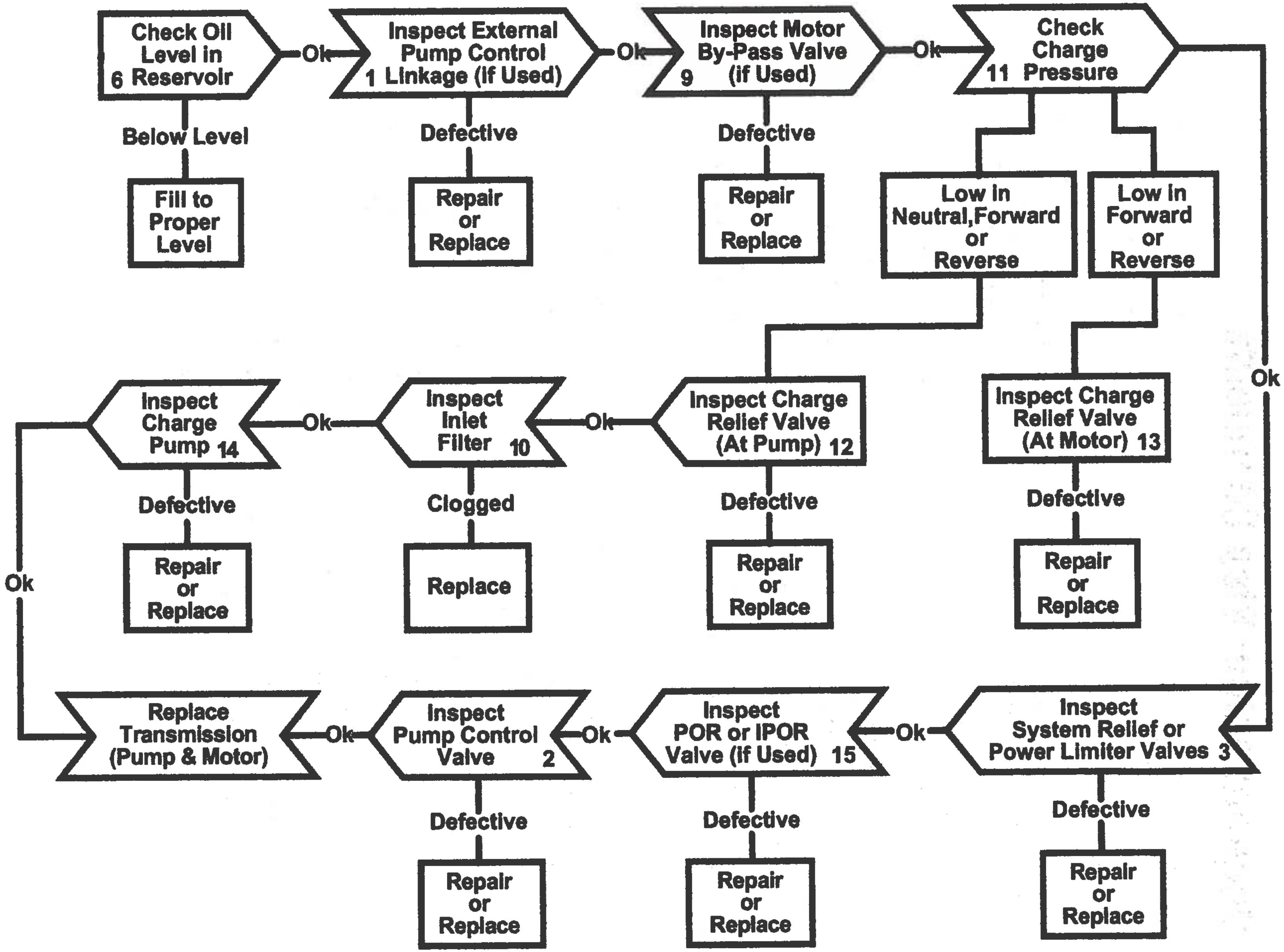

Check Oil Level in Reservoir 6
Below Level
Fill to Proper Level
Ok
Inspect External Pump Control Linkage (if Used) 1
Defective
Repair or Replace
Ok
Inspect Motor By-Pass Valve (if Used) 9
Defective
Repair or Replace
Ok
Check Charge Pressure 11
Low in Neutral,Forward or Reverse
Low in Forward or Reverse
Inspect Charge Relief Valve (At Motor) 13
Defective
Repair or Replace
Inspect Charge Relief Valve (At Pump) 12
Defective
Repair or Replace
Ok
Inspect Inlet Filter 10
Clogged
Replace
Ok
Inspect Charge Pump 14
Defective
Repair or Replace
Ok
Ok
Inspect System Relief or Power Limiter Valves 3
Defective
Repair or Replace
Ok
Inspect POR or IPOR Valve (if Used) 15
Defective
Repair or Replace
Ok
Inspect Pump Control Valve 2
Defective
Repair or Replace
Ok
Replace Transmission (Pump & Motor)

Diagram Action Step Comments

1. Inspect External Pump Control Linkage for:
   (Manual Operated Controls)
   A. Misadjusted or disconnected
   B. Binding, bent or broken

   (Hydraulic Remote Controls)
   A. Improper pilot pressure
   B. Defective proportional valve
   (See proportional valve manual for repairs.)

   (Electrical Operated Controls)
   A. Disconnected electrical signal connection

2. Inspect Pump Control Valve for:
   (Manual Operated Controls)
   A. Plugged control orifice
   B. Damaged mounting gasket
   C. Misadjusted, damaged or broken neutral return spring
   D. Broken control connector pin
   E. Broken or missing control linkage pin(s)
   F. Galled, stuck or bent control spool

   (Hydraulic Remote Controls)
   A. Plugged control orifice
   B. Damaged mounting gasket
   C. Misadjusted, damaged or broken neutral return spring (2)
   D. Broken control connector pin
   E. Broken or missing control linkage pin(s)
   F. Galled, stuck or bent control spool

   (Electrical Operated Controls)
   A. Plugged control orifice
   B. Damaged mounting gasket
   C. Galled, stuck or bent control spool
   D. Stuck solenoid valve(s)
   E. Defective solenoid coil(s)
   F. Misadjusted speed sensor (when used)
   G. Defective speed sensor (when used)
   H. Defective electronics module
   NOTE: When the electronic transit mixer control is used, follow the control box fault dector instructions.

3. Inspect System Relief or Power Limiter Valves for:
   (System Relief Valves)
   A. Improper pressure relief setting
   (Consult owners/operator manual for system relief valve settings)
   B. Damaged or missing O-ring and/or back-up ring(s)
   C. Plugged orifice
   D. Piston galled or stuck
   E. Valve poppet held off seat

   (Power Limiter Valves)
   A. Improper pressure relief setting
   (Consult owners/operator manual for power limiter valve setting.)
   B. Broken spring
   C. Valve held off seat

4. Inspect Shuttle Valve for:
   A. Bent or broken return centering spring
   B. Galled or stuck shuttle spool
   C. Bent or broken shuttle spool

5. Inspect Charge Check Valves for:
   A. Damaged or missing O-ring and/or back-up ring(s)
   B. Damaged check ball seat
   C. Stuck check ball

6. Check Oil Level in Reservoir:
   A. Consult owner/operators manual for the proper type fluid and level.

7. Inspect Heat Exchanger for:
   A. Obstructed air flow (air cooled)
   B. Obstructed water flow (water cooled)
   C. Improper Plumbing (inlet to outlet)
   D. Obstructed or insufficient fluid flow
   E. Cooling fan failure (if used)

8. Inspect Heat Exchanger By-Pass Valve for:
   A. Improper pressure setting
   B. Stuck or broken valve

9. Inspect Motor By-Pass Valve for:
   A. Valve held in partial and/or open position

10. Inspect Inlet Filter for:
    A. Plugged or clogged filter
    B. Obstructed inlet or outlet
    C. Collapsed inlet line to charge pump
    C. Open inlet to charge pump

11. *Check Charge Pressure:
    A. Consult page 4 in this manual for charge pressure gauge installation location.
    B. Consult owner/operators manual for charge relief valve settings.

12. *Inspect Charge Relief Valve for:
    (at Pump)
    A. Improper charge relief pressure setting
    B. Plugged Orifice
    C. Piston galled or stuck open and/or closed
    D. Damaged or missing O-ring
    E. Valve poppet held off seat

13. *Inspect Charge Relief Valve for:
    (at Motor)
    A. Improper charge relief pressure setting
    B. Plugged Orifice
    C. Piston galled or stuck open and/or closed
    D. Damaged or missing O-ring
    E. Valve poppet held off seat

14. Inspect Charge Pump for:
    (Standard and A-Pad Pumps)
    A. Broken drive tang
    B. Damaged or missing o-ring(s)
    C. Broken drive key
    D. Galled or broken gerotor set

    (B-Pad Pumps)
    A. Stripped or broken drive coupling
    B. Stripped or broken drive spline
    C. Damaged or missing o-ring(s)
    D. Broken drive key
    E. Galled or broken gerotor set

15. Inspect POR or IPOR for:
    (POR, Pressure Override)
    A. Plugged orifice
    B. Misadjustment of maximum pressure setting
    C. Stuck or missing check ball
    D. Stuck or broken sensing pin
    E. Stuck or broken control spool
    F. Obstructed or broken sensing line

    (IPOR, Internal Pressure Override)
    A. Plugged orifice
    B. Misadjustment of maximum pressure setting
    C. Load sensing pins reversed
    D. Stuck or broken sensing pin
    E. Stuck or broken control spool

Diagram Action Step Comments

*System / Charge Relief Valve
Pressure Setting Identification

The system and charge pressure relief valves are all factory preset. For identification, a pressure code is stamped on the hex plug located on the end of the system and charge pressure valve cartridges.

This same code is also used on the power limiter valves. The code number is stamped on the end of the valve cartridge. (Power limiter valves must be removed to view pressure code.) To determine the pressure setting of each valve, add a zero to the right of the stamped coded number.

Charge Pressure Valve Examples
016 = 11,0 bar [160 PSI] Setting
022 = 15,2 bar [220 PSI] Setting

System and Power Limiter Valve Pressure Examples
400 = 275 bar [4000 PSI] Setting
500 = 345 bar [5000 PSI] Setting

Hydraulic Fluid Recommendations

Introduction

The ability of Eaton hydraulic components to provide desired performance and life expectancy depends largely on the fluid used. The purpose of this document is to provide readers with the knowledge required to select the appropriate fluids for use in systems that employ Eaton hydraulic components.

One of the most important characteristic to consider when choosing a fluid to be used in a hydraulic system is **viscosity.** Viscosity choice is always a compromise; the fluid must be thin enough to flow easily but thick enough to seal and maintain a lubricating film between bearing and sealing surfaces. Viscosity requirements for each of Eaton's product lines are given on the back of this document.

Viscosity and Temperature

Fluid temperature affects viscosity. In general, as the fluid warms it gets thinner and its viscosity decreases. The opposite is true when fluid cools. When choosing a fluid, it is important to consider the start-up and operating temperatures of the hydraulic system . Generally, the fluid is thick when the hydraulic system is started. With movement, the fluid warms to a point where a cooling system begins to operate. From then on, the fluid is maintained at the temperature for which the hydraulic system was designed. In actual applications this sequence varies; hydraulic systems are used in many environments from very cold to very hot. Cooling systems also vary from very elaborate to very simple, so ambient temperature may affect operating temperature. Equipment manufacturers who use Eaton hydraulic components in their products should anticipate temperature in their designs and make the appropriate fluid recommendations to their customers.

Cleanliness

Cleanliness of the fluid in a hydraulic system is extremely important. Eaton recommends that the fluid used in its hydraulic components be maintained at ISO Cleanliness Code 18/13 per SAE J1165. This code allows a maximum of 2500 particles per milliliter greater than 5 µm and a maximum of 80 particles per milliliter greater than 15 µm. When components with different cleanliness requirements are used in the same system, the cleanest standard should be applied. OEM's and distributors who use Eaton hydraulic components in their products should provide for these requirements in their designs. A reputable filter supplier can supply filter information.

Fluid Maintenance

Maintaining correct fluid viscosity and cleanliness level is essential for all hydraulic systems. Since Eaton hydraulic components are used in a wide variety of applications it is impossible for Eaton to publish a fluid maintenance schedule that would cover every situation. Field testing and monitoring are the only ways to get accurate measurements of system cleanliness. OEM's and distributors who use Eaton hydraulic components should test and establish fluid maintenance schedules for their products. These maintenance schedules should be designed to meet the viscosity and cleanliness requirements laid out in this document.

Fluid Selection

Premium grade petroleum based hydraulic fluids will provide the best performance in Eaton hydraulic components. These fluids typically contain additives that are beneficial to hydraulic systems. Eaton recommends fluids that contain anti-wear agents, rust inhibitors, anti-foaming agents, and oxidation inhibitors. Premium grade petroleum based hydraulic fluids carry an ISO VG rating.

SAE grade crankcase oils may be used in systems that employ Eaton hydraulic components, but it should be noted that these oils may not contain all of the recommended additives. This means using crankcase oils may increase fluid maintenance requirements.

Hydraulic fluids that contain V.I. (viscosity index) improvers, sometimes called multi-viscosity oils, may be used in systems that employ Eaton hydraulic components. These V.I. improved fluids are known to "shear-down" with use. This means that their actual viscosity drops below the rated value. Fluid maintenance must be increased if V.I. improved fluids are used. Automotive automatic transmission fluids contain V.I. improvers.

Synthetic fluids may be used in Eaton hydraulic components. A reputable fluid supplier can provide information on synthetic fluids. Review applications that require the use of synthetic fluids with your Eaton representative.

Viscosity Requirements

Product Line	Minimum	Optimum Range	Maximum	ISO Cleanliness Requirements	Comments
Heavy Duty Piston	60 SUS	80 - 180 SUS	10,000 SUS	18/13	
Pumps and Motors	[10 cSt]	[16 - 39 cSt]	[2158 cSt]		

Additional Notes:

- Fluids too thick to flow in cold weather start-ups will cause pump cavitation and possible damage. Motor cavitation is not a problem during cold start-ups, except for two speed motors. Thick oil can cause high case pressures which in turn can blow motor shaft seals.

- When choosing a hydraulic fluid, all the components in the system must be considered and the optimum viscosity range adjusted accordingly. For example, when a medium duty piston pump is combined with a Geroler motor the optimum viscosity range becomes 100 - 150 SUS [20 - 32 cSt] and viscosity should never fall below 70 SUS [13 cSt].

- If the natural color of the fluid has become black it is possible that an overheating problem exists.

- If the fluid becomes milky, water contamination may be a problem.

- Take fluid level reading when the system is cold.

- Contact your Eaton representative if you have specific questions about the fluid requirements of Eaton hydraulic components.

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Eden Prairie, MN 55344
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ISO-9001 CERTIFICATED FIRM
DET NORSKE VERITAS INDUSTRY BV, THE NETHERLANDS

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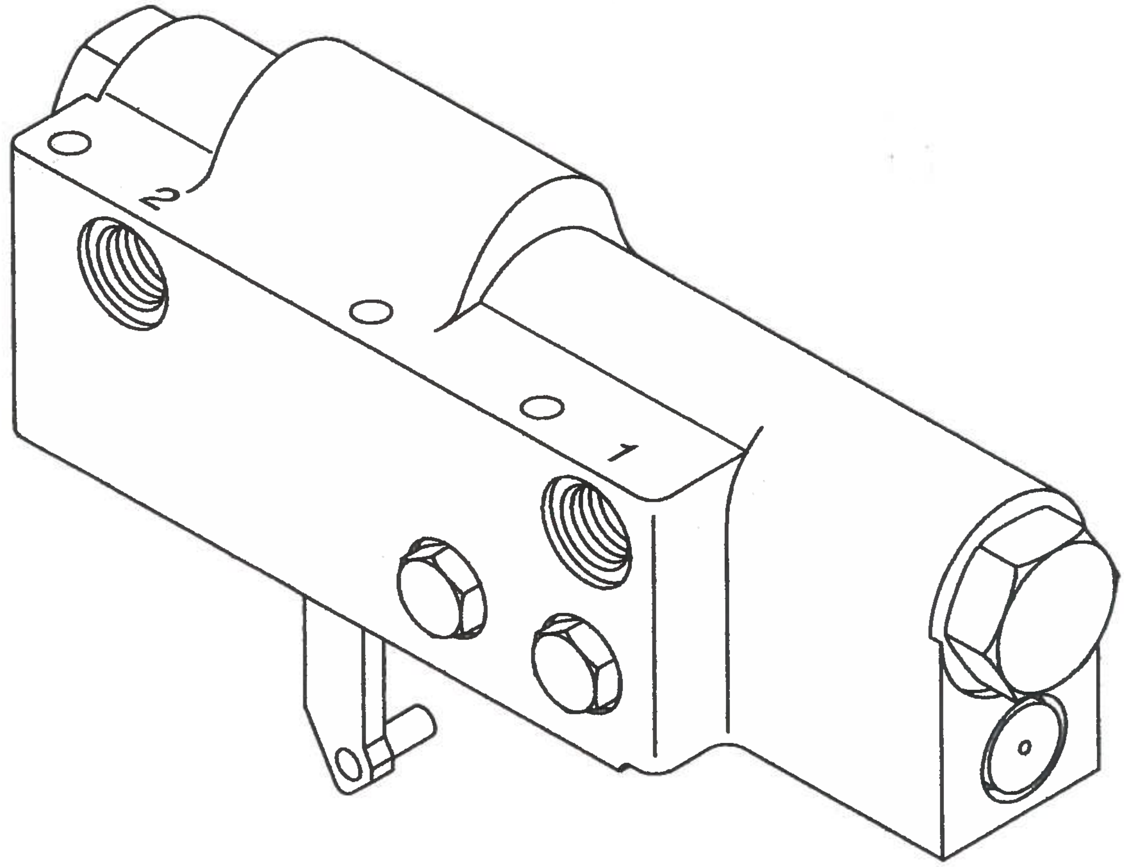
Eaton®
Heavy Duty Hydrostatics

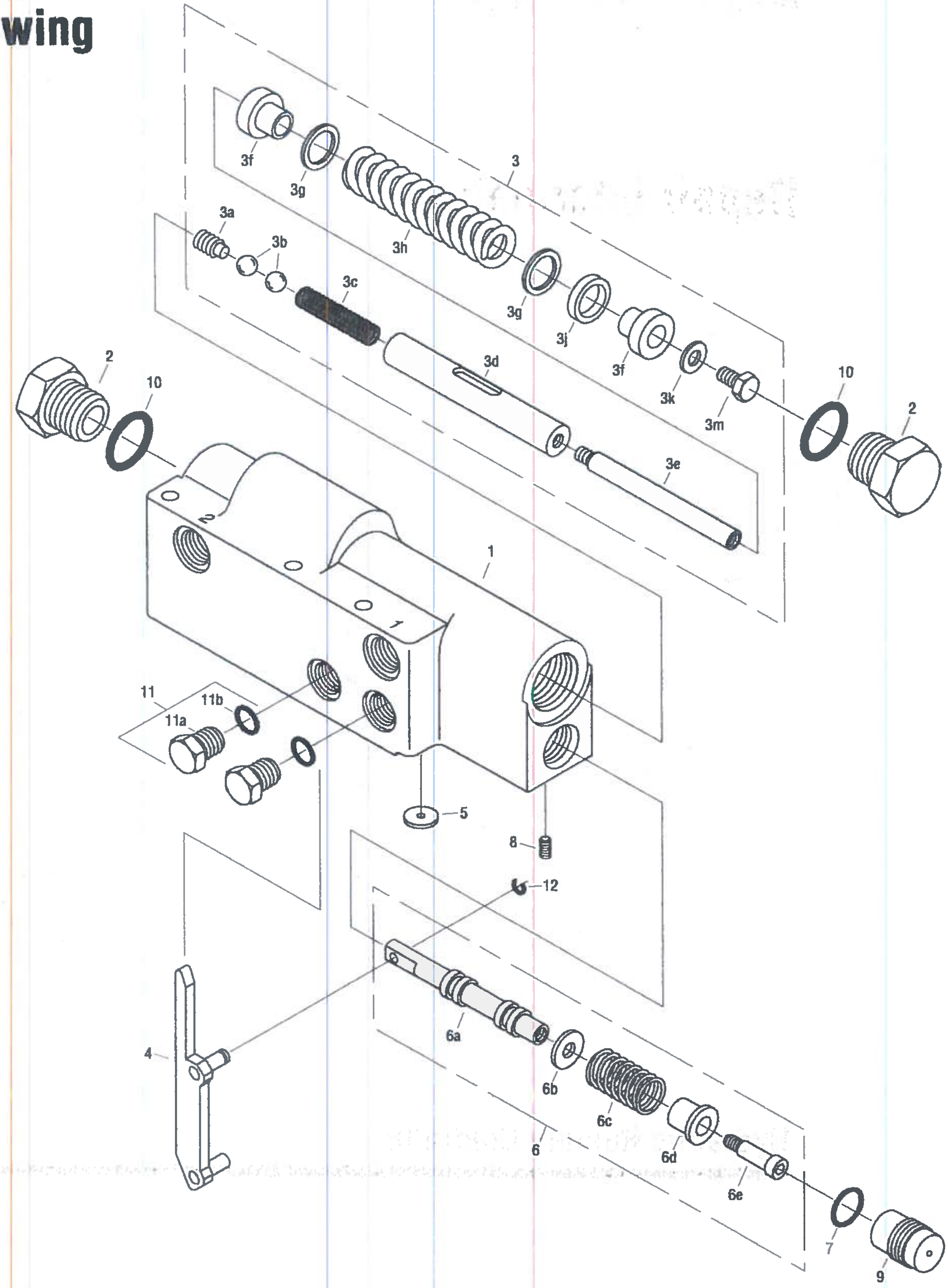
No. 7-417
October, 1993

Repair Information



Hydraulic Remote Controller

Parts Drawing



Disassembly

Cleanliness is extremely important when repairing hydraulic controls. Work in a clean area.

Note: The numbers in () correspond to the numbers in the parts drawing.

1. Remove the retaining ring (12) and the connecting link (4).

2. Remove the two o-ring/plug assemblies (11).

3. Remove the two plugs (2) and o-rings (10) and slide the control piston subassembly (3) from the body (1).

Note: Disassembly of the control piston subassembly (3) is not recommended. The threads at both ends of the bushing rod (3e) are Loctited. If disassembly is necessary, you may apply heat to weaken the Loctite.

4. Loosen the set screw (8) 1 or 2 turns then unscrew the spring box adjustment screw (9). Remove o-ring (7).

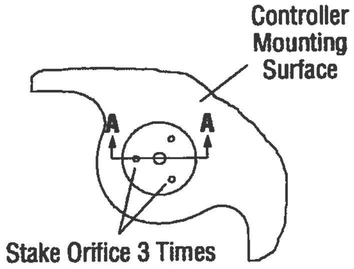
5. Slide the control spool subassembly (6) from the body (1).

Note: Disassembly of the control spool subassembly (6) is not recommended. The threads are Loctited. If disassembly is necessary, you may apply heat to weaken the Loctite.

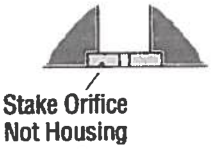
Note: Do not remove the orifice (5) unless it is damaged or its size is to be changed. To remove the orifice, strike it in the center with a center punch. This will curl the orifice allowing it to be removed.

Important: Do not flatten and reuse orifices.

Install a new orifice and stake it 3 times, with a center punch, to hold it in place.



Section A-A



Reassembly

Wash all parts in clean solvent and blow them dry with filtered compressed air. Do not wipe parts dry with cloth or paper towels, lint in a hydraulic system will cause damage.

Replace all o-rings. Lubricate them before installation.

6. If the control piston subassembly (3) was taken apart, reassemble it. Install the same thickness of bushing washers (3g) and spacer (3j). Replace any worn parts.

Note: The spacer (3j) is not used on all control piston subassemblies.

7. Apply Loctite 271, per the manufacturer's instructions, to the threads at both ends of the bushing rod (3e) and tighten them to 10.3 - 12.4 Nm [91 - 110 lb-in].

Important: Do not apply Loctite to the set screw (3a).

8. Apply a coating of clean hydraulic fluid to the control piston subassembly (3) and slide it into the body (1).

9. Install plugs (2) use new o-rings (10) and tighten them to 133 - 160 Nm [98 - 118 lb-ft].

10. If the control spool subassembly was taken apart, reassemble it. Apply Loctite 271, per the manufacturer's instructions, to the threads of the shoulder screw (6e) and tighten it to 3.7 - 4.5 Nm [33 - 40 lb-in].

11. Apply a coating of clean hydraulic fluid to the control spool subassembly (6) and slide it into the body (1).

12. Install the spring box adjustment screw (9) with a new o-ring (7). Screw it in until the control spool subassembly (6) end play is .000 to .025 mm [.000 to .001 in].

13. Tighten set screw (8) to 3.7 - 4.5 Nm [33 - 40 lb-in].

14. Install the control link (4) by slipping it between the two balls (3b) and securing it with retaining ring (12). The link should be perpendicular to the mounting surface.

⚠ WARNING

Personal injury or death may result if an out of neutral adjustment condition exists. See the back page of this document for neutral adjustment procedure.

WARNING

After the controller has been repaired and reinstalled on the pump, it may be necessary to adjust the controller so pump output is zero when no control pressure is applied.

When a repaired controller is installed on a vehicle steps must be taken to assure that no injury or damage results if the vehicle moves due to the pump not being in neutral. Eaton suggests jacking the vehicle off the ground and watching for wheel rotation indicating an out of neutral adjustment condition.

Neutral Adjustment Procedure

With the pump operating with 13.79 bar [200 PSI] charge pressure and zero pilot control pressure, remove the plug (2) from the shaft end of the controller. Using a hex key turn the set screw (3a) until pump output is zero. Take care not to push or pull the control piston when making the adjustment. Next, turn the set screw (3a) until the unit just starts to go into stroke in one direction. Then, count the turns to get it to just stroke in the other, 2 to 4, and set the set screw (3a) half way in between. Install plug (2) and o-ring (10) tighten it to 133 - 160 Nm [98 - 118 lb-ft].

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EATON

Eaton®
Hydrostatic Pumps

No. 7-606
March, 1995

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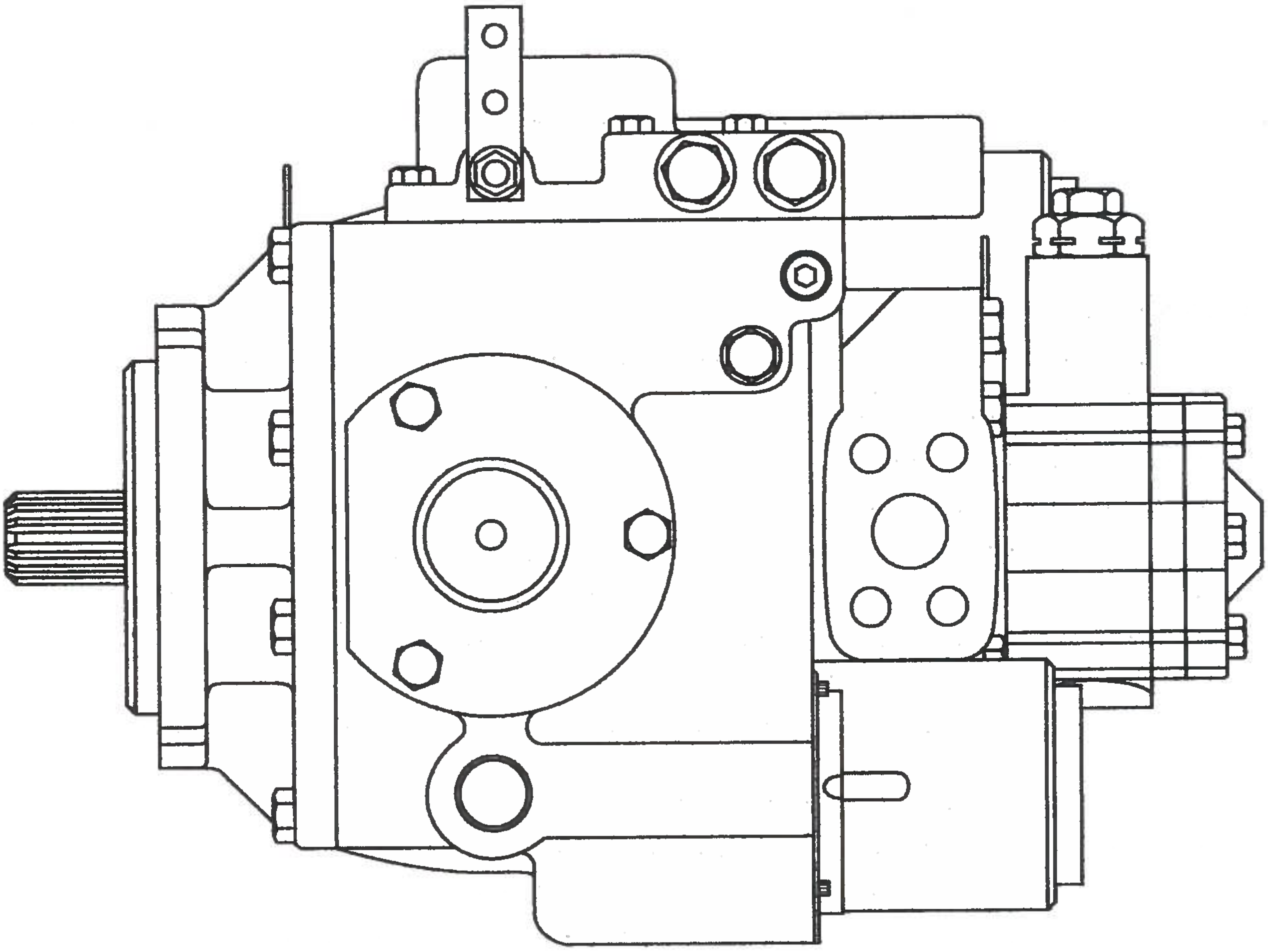
Repair Information



Series 1 Models 33-64
Hydrostatic Variable Pumps

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Introduction

This manual provides service information for Eaton Models 33 thru 64 Variable Pumps. Step by step instructions for the complete disassembly, inspection and reassembly of the pump are given. The following recommendations should be followed to insure successful repairs:

- Most repairs require the removal of the pump from the vehicle.
- Cleanliness is extremely important.
- Clean the port areas thoroughly before disconnecting the hydraulic lines.
- Plug the pump ports and cover the open hydraulic lines immediately after they're disconnected.
- Drain the oil and clean the exterior of the pump before making repairs.
- Wash all metal parts in clean solvent.
- Use compressed air to dry the parts. Do not wipe them dry with paper towels or cloth; Lint in a hydraulic system will cause damage.
- The compressed air should be filtered and moisture free.
- Always use new seals when reassembling hydraulic pumps.
- For replacement parts and ordering information refer to parts list 6-608.
- Lubricate the new rubber seals with a petroleum jelly like Vaseline before installation.
- Torque all bolts over gasketed joints, then repeat the torquing sequence to make-up for gasket compression.
- **Verifying the accuracy of pump repairs on an authorized test stand is essential.**

ID Tag

A - Displacement (cu.in./rev.)
- 0033 = 3.3
- 0039 = 3.9
- 0046 = 4.6
- 0054 = 5.4
- 0064 = 6.4
- 0076 = 7.6

B - Identifies Type of Product
- 21 = Variable Displacement Pump
- 31 = Fixed Displacement Motor
- 41 = Variable Displacement Motor
- 61 = Tandem Variable Displacement Pumps

C - Identifies Specific Unit Configuration

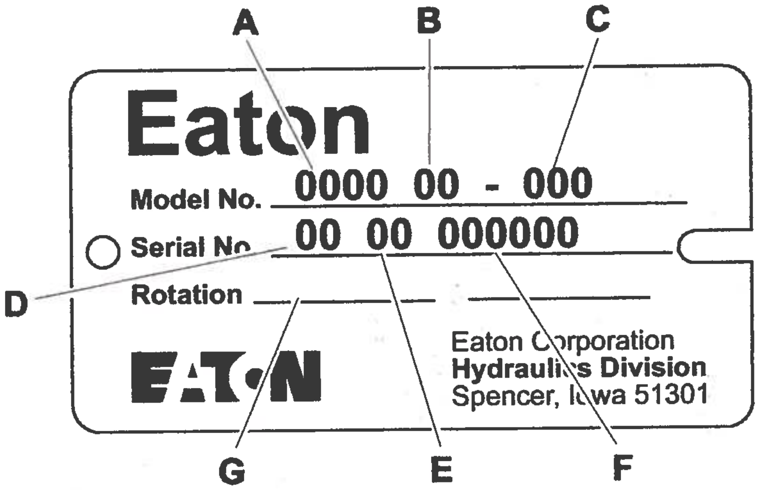
D - Month of Manufacture

E - Year of Manufacture

F - Specific Serial Number of Unit

G - Identifies Direction of Input Shaft (Pumps Only) Rotation

Observed from Shaft End of Unit
- CW = Clockwise
- CCW = Counterclockwise

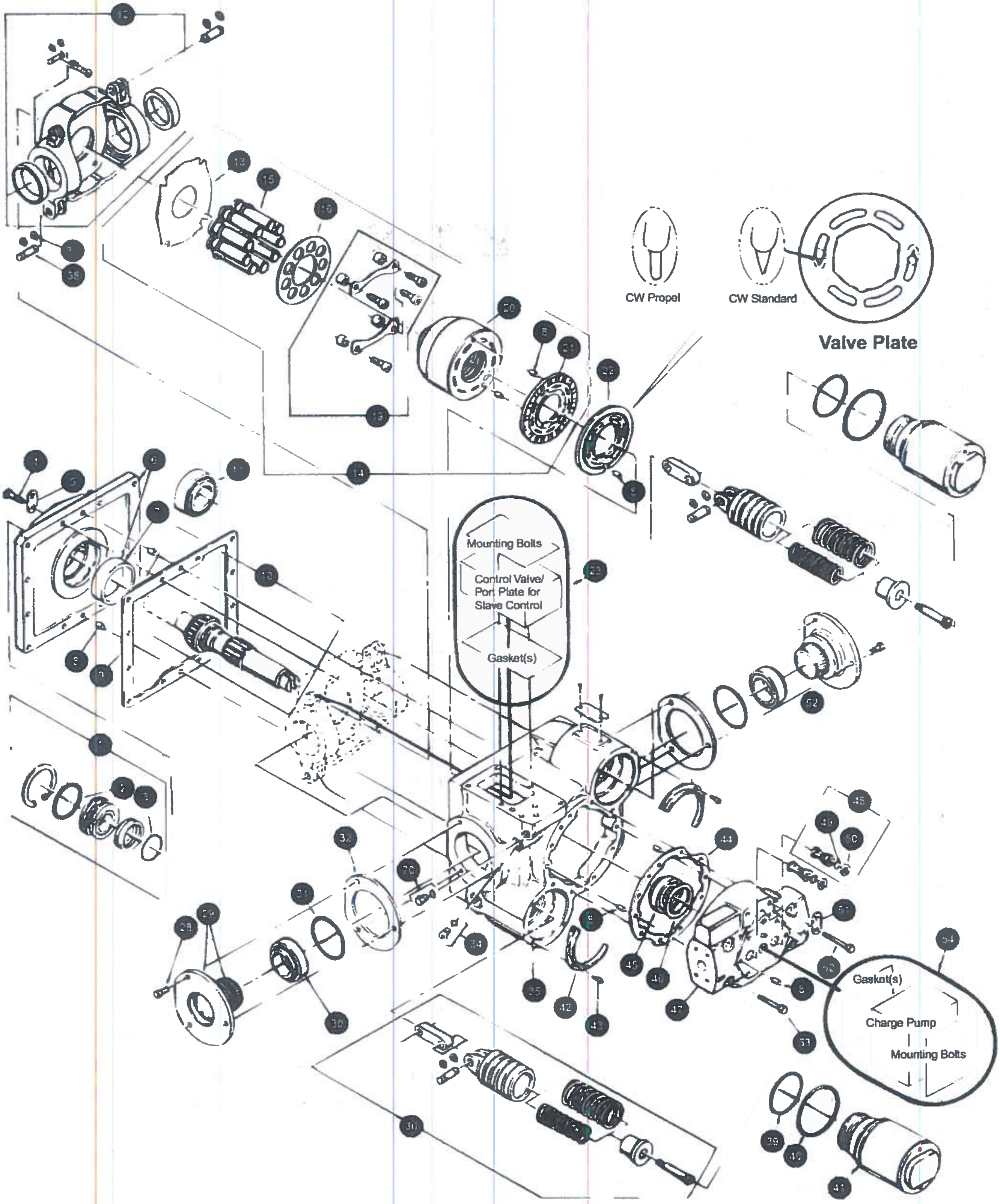


Required Tools

- 9/64 in. Hex Key
- 1/4 in. Hex Key
- 1/2 in. Socket
- 9/16 in. Socket
- 5/8 in. Socket
- 3/4 in. Socket
- 7/8 in. Socket
- 1 in. Socket
- 1-3/8 in. Socket
- Dial Indicator with Magnetic Base
- Spring Compression Scale (0-10 lbs)
- No. 5 or 7 Retaining Ring Pliers
- Small Pair of External Retaining Ring Pliers (45° or 90°)
- Adjustable joint Pliers
- 3 in.X 1/4-20 Bolt
- Breaker Bar or Ratchet Wrench
- Torque Wrench (200 lb-ft capacity)
- 18 to 20 in. Adjustable Wrench
- Shaft End Spacer (Special)
- Hammer (steel and Plastic)
- Depth Micrometer with Extensions
- Parallel Bars
- Slide Hammer
- Split Blade Bearing Puller
- Prick Punch
- Scribe
- Punch
- Arbor Press
- Clean, Lint Free Cloths
- Loctite
- Light Petroleum Jelly
- Suitable Solvents and Cleaners
- Rotating Seal Puller (Special)
- Low Clearance Bearing Puller (Special)
- Bearing Cone Driver (Special)
- Check Valve Puller (Special)

Special Tools are shown on pages 25 and 26.

Exploded View Drawing



Models 33 thru 64 Variable Pump Parts

Item No.	Description	Qty.
1	Shaft Seal Kit	1
2	O-ring	1
3	O-ring	1
4	Mounting Flange Bolt	12
5	Shipping Strap	2
6	Mounting Flange S/A	1
7	Bearing Cup	1
8	Dowel Pin	9
9	Mounting Flange Gasket	1
10	Drive Shaft S/A	1
11	Replacement Bearing Kit	♦
12	Swashplate S/A	1
13	Thrust Plate	1
14	Rotating Group	1
15	Piston and Slipper S/A	9
16	Slipper Retainer Plate	1
19	Retaining Strap and Bolts	2
20	Cylinder Barrel	1
21	Bearing Plate	1
22	Valve Plate	1
23	Control Valve Option	1
28	Trunnion Bolt	6
29	Trunnion S/A	2
30	Replacement Bearing Kit	♦
31	O-ring	2
32	Trunnion Shims	♦
34	Plug and O-ring	1
35	Pump Housing	1
36	Servo Piston S/A	2
37	Retaining Ring	8
38	Pin	4
39	O-ring	2
40	O-ring	2
41	Servo Sleeve	2
42	Servo Sleeve Retainer	2
43	Cap Screw	6
44	End Cover Gasket	1
45	End Cover Bearing	1
46	Shaft Shims	♦
47	End Cover	1
48	Check Valve S/A	2
49	O-ring	2
50	Back-up Ring	2
52	End Cover Bolt	6
53	End Cover Bolt	2
54	Charge Pump	1
70	Plug and O-ring	1

♦ Parts used as required.

Disassembly

Due to the complexity of the heavy duty pump certain subassemblies are disassembled, inspected, and reassembled upon removal from the pump. This procedure insures repair accuracy and helps avoid the loss of small parts.

1 Clean the exterior of the pump and drain the oil.

2 Position the pump so the shaft seal is accessible.

Important: Cleanliness is extremely important; be sure that no contaminates get into the pump.

3 Using a retaining ring pliers remove the retaining ring.

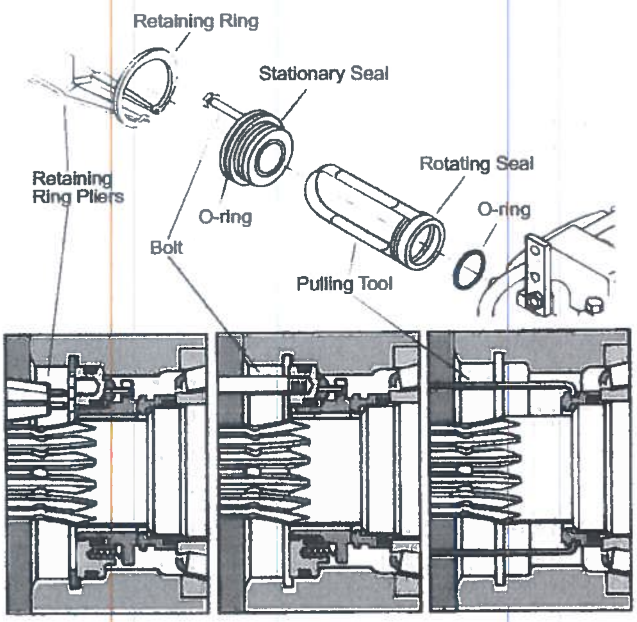


Figure 1

4 Screw a 3 in. X 1/4-20 bolt into the threaded hole in the stationary seal. Pull on the bolt to remove the seal.

5 Use the special pulling tool, Owatonna Tool Co. P/N CAS 1844, to remove the rotating seal, see figure 1. If the special tool is not available pull out the rotating seal with a wire bent to the shape of the puller.

Note: Detailed drawings of all special tools are given in Appendix E, in the back of this manual.

6 Remove the o-ring; it will either be in the rotating seal or on the shaft.

Note: If you are just replacing the shaft seal jump ahead to step 105 on page 20.

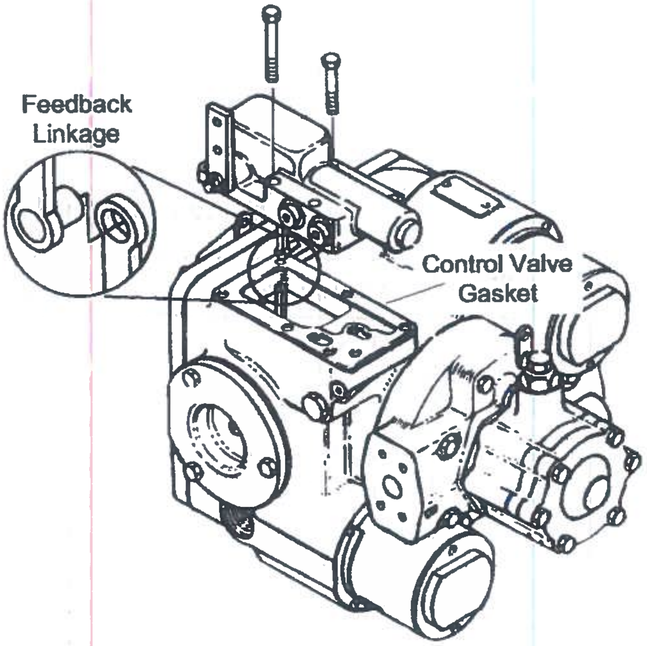


Figure 2

7 Remove the six hex head bolts that hold the control valve to the pump.

8 Lift the control valve away from the pump and disengage the feedback linkage, see figure 2.

9 Remove the control valve gasket.

10 Inspect the control valve: Start by thoroughly flushing the control valve with clean solvent. Then blow it dry with compressed air. Be sure to blow through all of the control valve's internal passages.

Inspect the control valve linkage. Move the control lever back and forth; it should move freely without binding. There should be no free play in the feedback link or control lever.

Check the control valve orifice; if it is plugged after flushing clean or replace it. Appendix C gives information on orifice replacement.

Important: The control orifice may be installed in different locations depending on which pump control is used. If it is removed a new orifice must be installed in the same location.

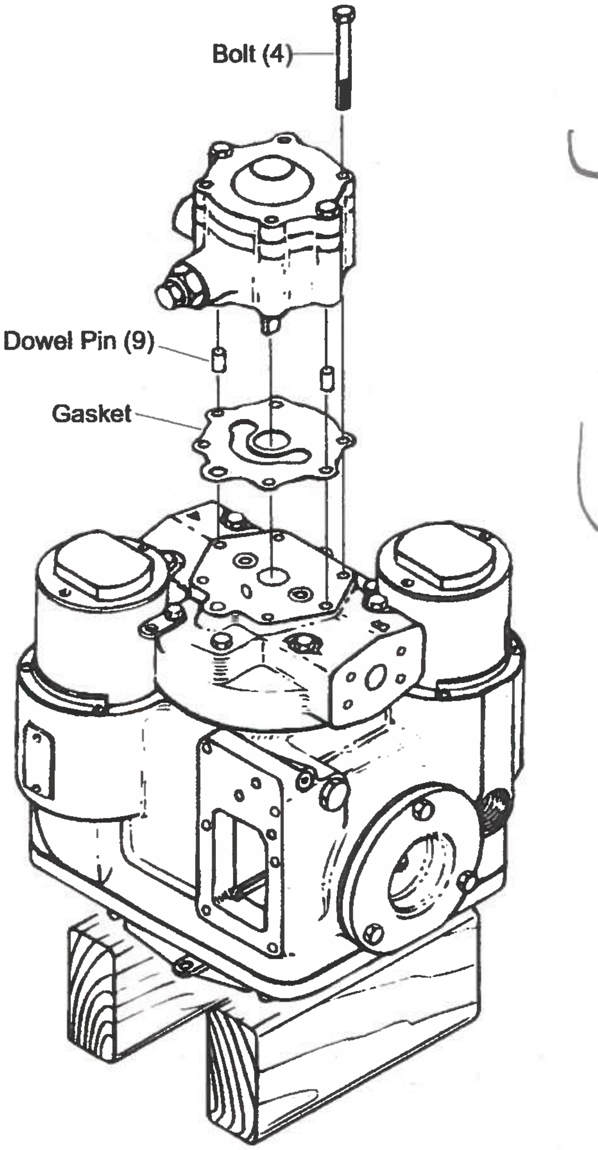


Figure 3

11 Reposition the pump so the shaft is vertical and the charge pump is on top. Stand the pump on two blocks of wood as shown in figure 3.

12 Remove the four bolts that hold the charge pump to the end cover, see figure 3. The two remaining bolts hold the charge pump together.

Note: Information on charge pump repair is given in Appendix D.

13 Lift the charge pump from the end cover. Remove the gasket and two dowel pins.

Note: Keep track of the dowel pins, see figures 3, 5, and 8. There is a total of nine dowel pins in the pump. It is a good idea to put them in a small box so they don't get lost.

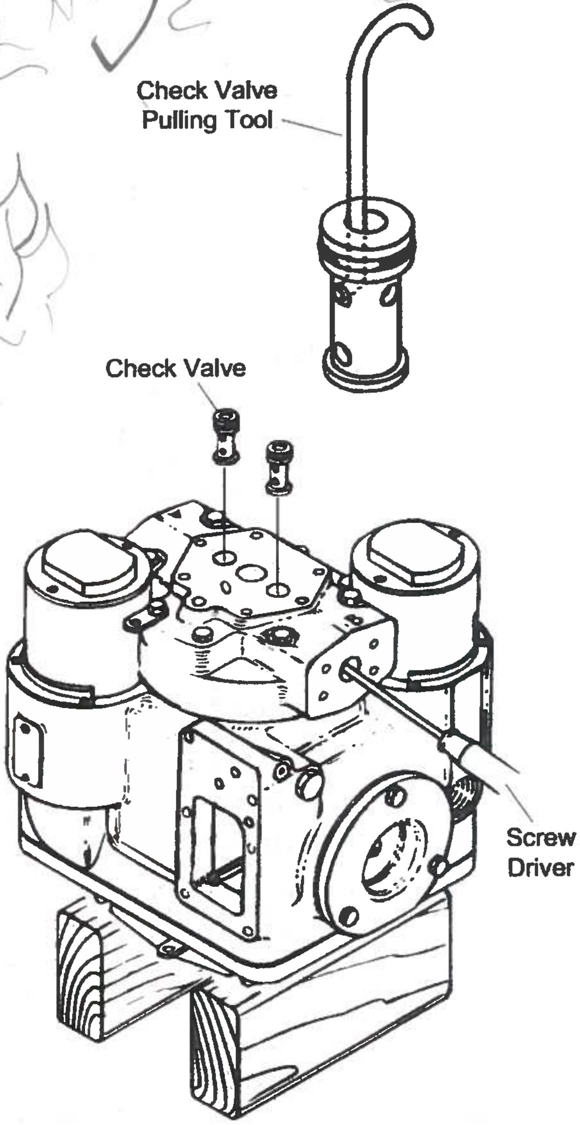


Figure 4

14 Pull the two check valves from the end cover; Hook the short end of the pulling tool in one of the check valve cross holes, see figure 4.

If the pulling tool is unavailable remove each check valve by inserting a screw driver into the output port and prying up on the bottom of the check valve.

Note: A detailed drawing of the check valve pulling tool in given in Appendix E.

15 Remove the o-rings and back-up rings from the check valves.

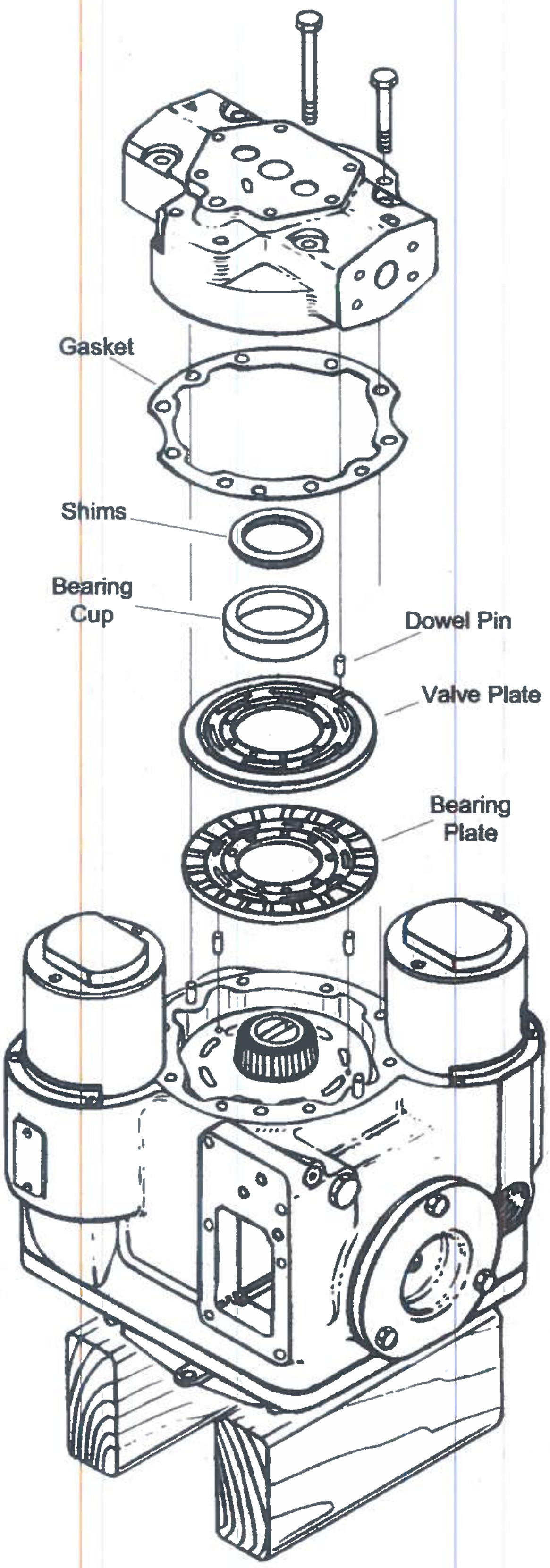


Figure 5

16 Remove the end cover.

Caution: The cylinder barrel spring pre-load will damage the pump's internal parts if the end cover is removed incorrectly.

Start by removing six of the eight bolts that hold the end cover to the pump. Leave two bolts that are directly across from each other tight.

Next, loosen the two remaining bolts one or two turns. The end cover should rise as the bolts are loosened. If it doesn't tap it with a plastic hammer to break the gasket seal.

After the gasket seal is broken loosen the bolts gradually and evenly until the cylinder barrel spring pre-load is relieved.

Remove the bolts and lift the end cover from the pump. Be careful; do not drop the valve plate, it may lift away with the end cover.

Important: Use care when handling the pump's internal parts. They are machined to extremely close tolerances.

17 Turn the end cover over and set it on a clean cloth.

Important: Always protect machined surfaces.

Note: The standard end cover is shown in figure 5. Two optional end covers are available. Use the same removal procedure for the optional end covers. Breakdowns of the optional end covers are shown in the appendices:

Optional End Cover	Appendix	Page
IPOR	A	21
Power Limiter Valve	B	22

18 Remove the valve plate and dowel pin; they will either be on the end cover or bearing plate.

Note: Pump valve plates are unidirectional and must be matched to the input direction of the pump. The metering slots indicate the valve plate's direction, see figure 6. Also be aware that there are different shaped metering slots; 'V' shaped metering slots are standard, and kidney shaped metering slots are on propel valve plates.

19 The bearing cup is slip-fit into the end cover. The shims under the bearing cup adjust the shaft end play. It is not necessary to remove these parts at this time.

20 Remove the bearing plate.

21 Remove the end cover gasket.

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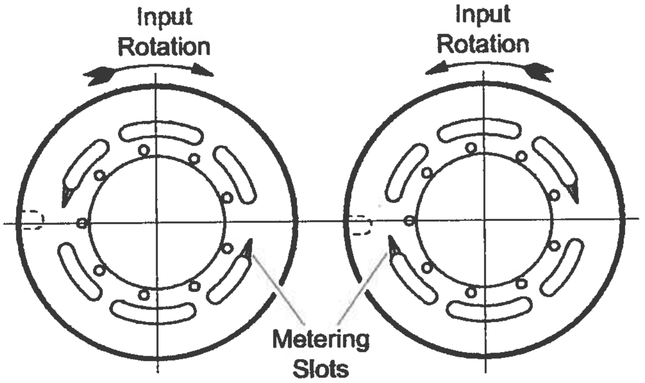


Figure 6

22 Remove the two dowel pins from cylinder barrel face, see figure 5.

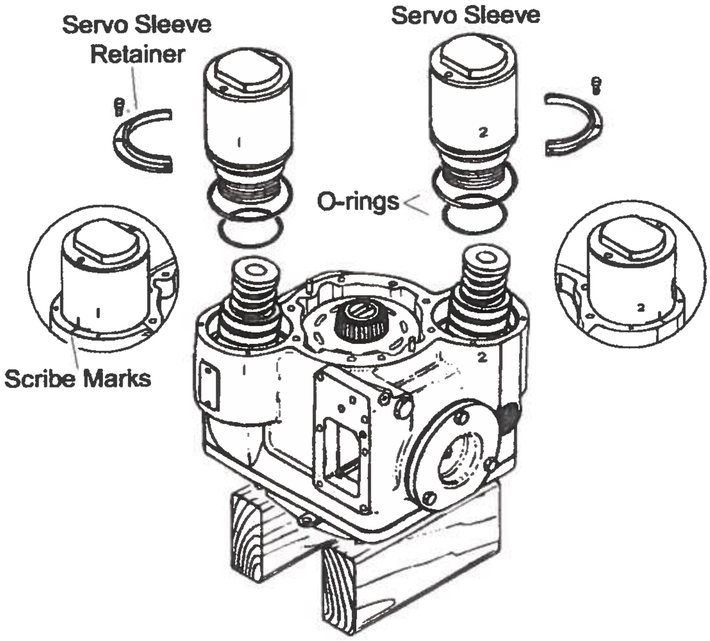


Figure 7

23 Mark the pump housing and servo sleeves so they can reinstalled in the same locations.

24 Remove the servo sleeve retainers.

25 Scribe position marks on each servo sleeve; Make a horizontal line where the servo sleeve and pump housing meet. Then make a vertical line that starts on the servo sleeve and ends on the housing, see figure 7. These marks will indicate how far to screw the servo sleeves in during reassembly.

26 Remove the servo sleeves.

27 Remove two o-rings from each servo sleeve.

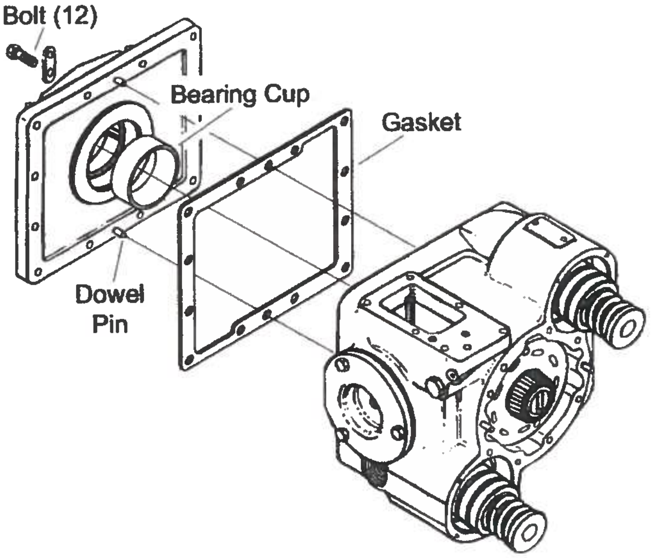


Figure 8

28 Reposition the pump so the control valve mount is on top.

29 Remove the twelve hex head bolts that hold the mounting flange to the pump.

30 Remove the mounting flange, tapping it with a plastic hammer will help to break it loose.

31 Remove the mounting flange gasket.

Note: Do not remove the bearing cup from the mounting flange unless it is damaged. Go to step 34 if the bearing cup is undamaged.

32 Use an internal bearing puller or a long punch to remove the old bearing cup. Be careful; do not damage the mounting flange.

33 Press the new bearing cup into the mounting flange. Be sure that it is pressed all the way to the bottom of the recess.

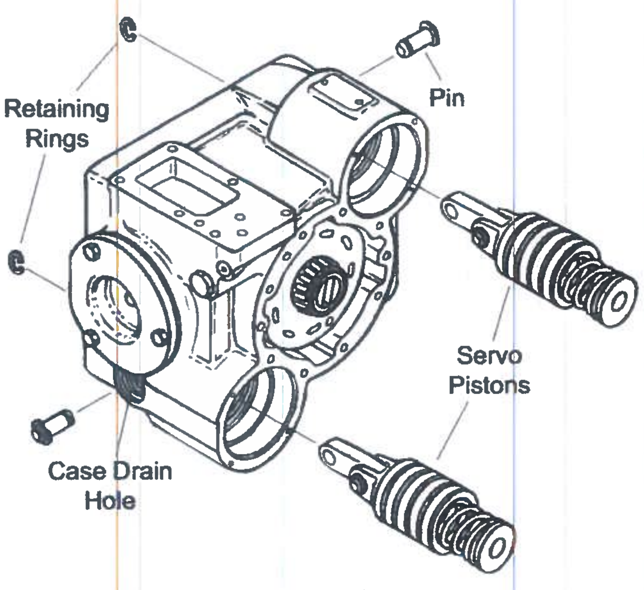


Figure 9

34 Remove the inside retaining ring from each of the pins that connect the servo piston links to the swashplate. Slide the pins out through the case drain holes and remove the servo pistons, see figure 9.

Note: Disassembly of the servo pistons is not required unless they are damaged.

35 Mark the pump housing and the trunnions so they can be reinstalled in the same locations.

36 Repeat the following steps to remove each trunnion:

Remove the three hex head bolts that hold the trunnion to the pump

The trunnion fits into the pump tightly; use a slide hammer to loosen it. Screw the slide hammer into the threaded hole in the trunnion. The sizes of the threaded trunnion holes are listed below:

Model Number	Screw Size
33, 39, 46	3/8-16
54, 64	7/16-14

Remove the trunnions and shims.

Important: Keep the shims with each trunnion; they must be reinstalled on the same trunnion during reassembly. The shims pre-load the trunnion bearings.

Remove the o-ring from the trunnion, see figure 10.

37 If the trunnion bearings are damaged replace them. A split blade bearing puller will be needed to remove the bearing cone from the trunnion. Use a press to install the new bearing cone.

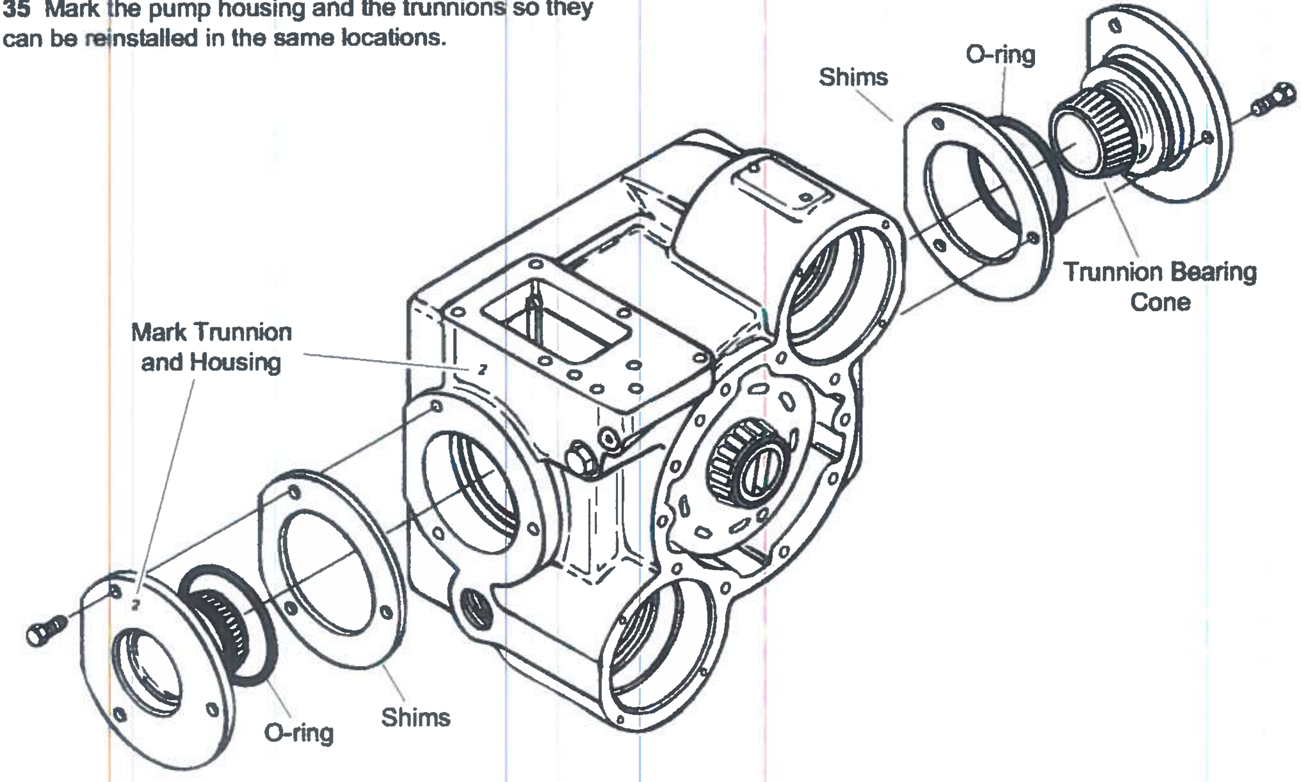


Figure 10

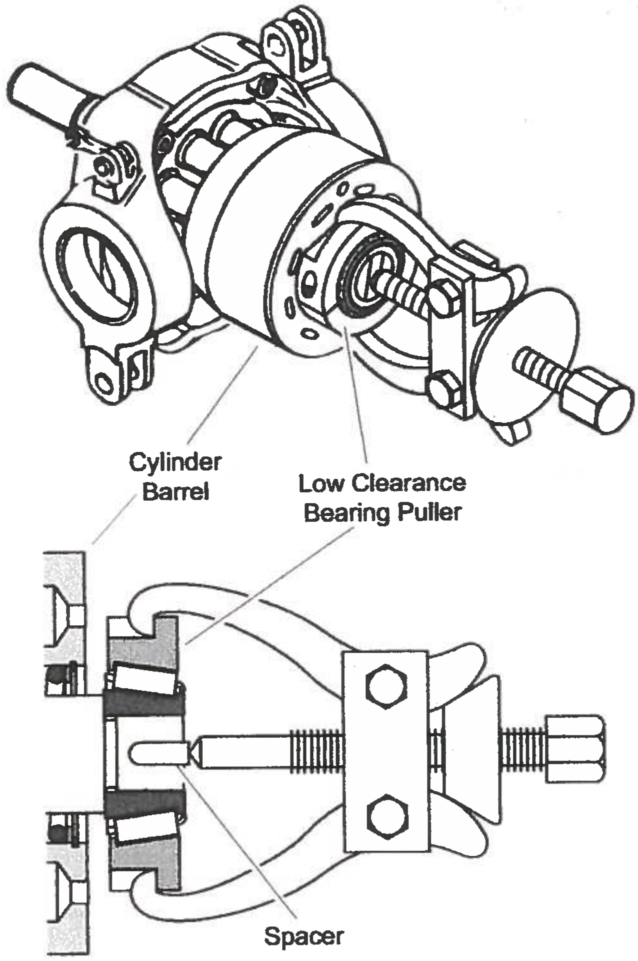


Figure 11

38 Carefully remove the swashplate, cylinder barrel and shaft through the mounting flange end of the housing.

39 Pull the end cover bearing cone from the shaft. Use a special low clearance bearing puller and place a spacer in the slot in the shaft.

Note: Detailed drawings of the low clearance bearing puller and spacer are given in Appendix E. The low clearance bearing puller was designed to protect the cylinder barrel face, see cut-away in figure 11. The spacer will prevent the slotted end of the shaft from spreading.

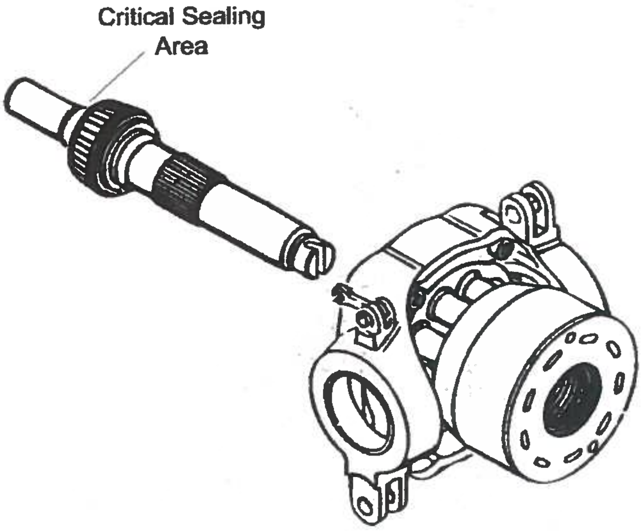


Figure 12

40 Remove the shaft and bearing assembly from the swashplate and cylinder barrel. Keep the cylinder barrel and pistons together.

Note: Do not remove the bearing cone from the shaft unless it is damaged. Go to step 43 if the bearing cone is undamaged.

41 Press the old bearing cone from the shaft.

Caution: Do not damage the sealing area of the shaft, see figure 12. The shaft sealing area is between the bearing journal and the keyway or splined end of the shaft. This area is extremely critical.

42 Press the new bearing cone onto the shaft. Use the special stop limit tool shown in Appendix E of this manual. The position of the bearing cone on the shaft is important.

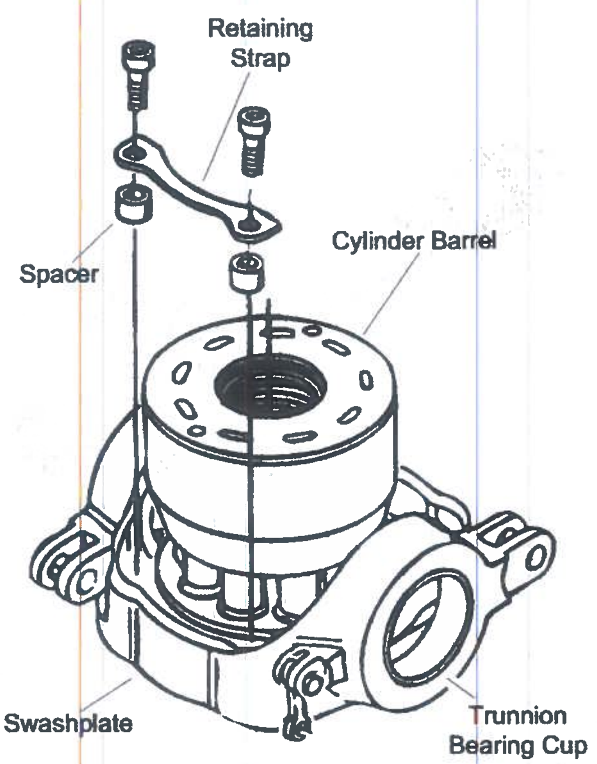


Figure 13

43 Set the swashplate and cylinder barrel assembly on one of the trunnions; in this position it will be easier to break the retaining strap bolts loose. Remove one of the retaining straps and loosen the other.

Important: keep the cylinder barrel and pistons together.

44 Reposition the swashplate and cylinder barrel assembly so the cylinder barrel is on the bottom. Remove the swashplate by lifting it slightly and sliding it over to disengage the retaining strap.

45 Remove the retaining strap and thrust plate from the swashplate.

46 Replace the trunnion bearing cups if they are damaged. Use a long punch to remove the old bearing cups, then carefully press the new bearing cups into the swashplate.

Reassembly

Inspect the cylinder barrel, pistons, piston slippers, and thrust plate. Replace any worn or damaged parts. Check all mating surfaces; replace any parts with scratches or burrs that could cause leakage. Inspect parts for excessive wear and replace as necessary. Wash all metal parts in clean solvent and blow them dry with compressed air. Do not wipe parts dry with paper towels or cloth. Lint in a hydraulic system will cause damage.

Always use new seals when reassembling hydraulic pumps. Refer to parts list 6-608 for seal part numbers, replacement parts, and ordering information.

Important: During reassembly lubricate the new rubber seals with a petroleum jelly like Vaseline. Also lubricate all machined surfaces and bearings with clean hydraulic fluid.

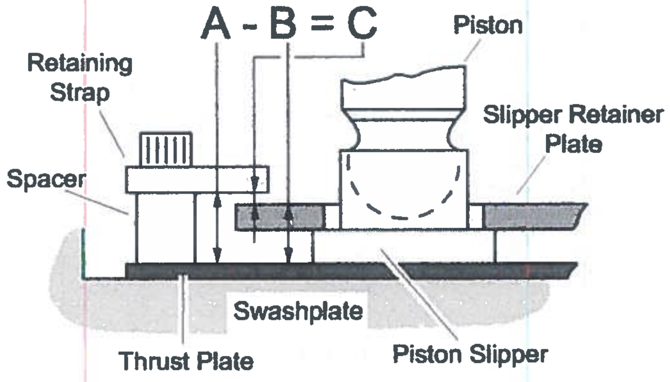


Figure 14

47 Before beginning reassembly check the piston slipper clearance:

First, use a vernier calipers to measure the spacer height, height "A" in figure 14.

Next, measure the thickness of the slipper retainer plate and piston slippers, Thickness "B" in the figure.

Finally, calculate the piston slipper clearance "C" by subtracting thickness "B" from height "A".

Clearance "C" must not exceed .008 in. [,20 mm].

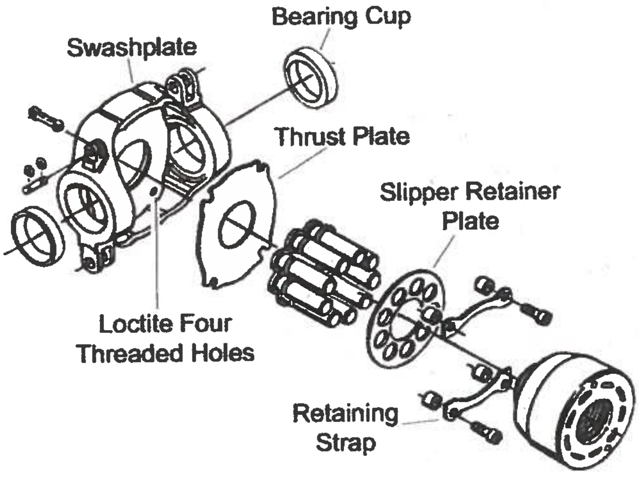


Figure 15

48 Position the cylinder barrel, pistons, and slipper retainer so the piston slippers are on top.

49 Apply two drops of Loctite 271 in each of the four retaining strap holes in the swashplate. Apply the Loctite no closer than two threads from the running surface. Do not apply Loctitie to the retaining strap bolts.

Caution: Remove all excess Loctite, it will contaminate the pump if not removed.

50 Place the thrust plate in the swashplate.

51 Install one of the retaining straps, and leave the bolts loose.

52 Apply a light coating of clean hydraulic fluid to the thrust plate.

53 Fit the swashplate onto the cylinder barrel assembly. Be sure the slipper retainer plate is between the swashplate and retaining strap.

54 Turn the swashplate and cylinder barrel over so the swashplate is on the bottom.

55 Install the second retaining strap and tighten all four retaining strap bolts to 18 lb-ft [25 Nm]. Remove all excess Loctite.

56 Liberally lubricate the pistons slippers, thrust plate, retainer plate, pistons, and cylinders. These parts must have sufficient start-up lubrication.

57 Slide the shaft and bearing assembly through the swashplate into the cylinder barrel.

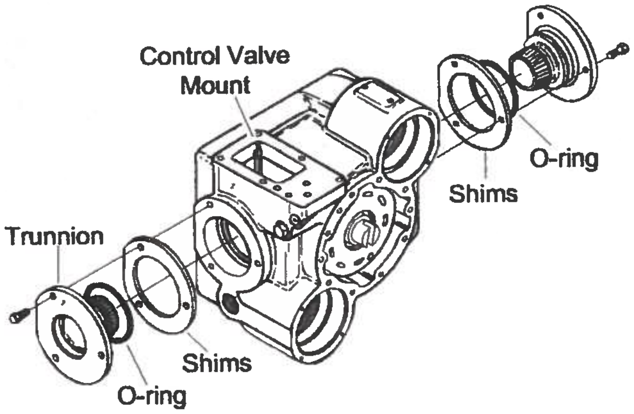


Figure 16

58 Carefully, put the swashplate, cylinder barrel, and shaft into the pump housing. Be sure the feedback linkage is by the control valve mount.

59 Lubricate and install a new o-ring on each trunnion.

60 Install the trunnions and shims in their original locations.

61 Install the trunnion bolts and tighten them to the specified torque given below:

Model Number	Trunnion Bolt Torque
33, 39, 46	28 lb-ft [38 Nm]
54, 64	44 lb-ft [60 Nm]

62 After the bolts are torqued strike one of the trunnions to free up the swashplate's movement.

63 Measure the swashplate breakaway force with a spring compression scale. Attach the scale to the feedback linkage as shown in figure 17. A swashplate breakaway force of 2 to 5 lb [,9 to 2,3 Kg] is required. Add or subtract trunnion shims as needed.

Important: The trunnion shims on each side of the pump should be equal thickness. The maximum allowable difference between the sides is .010 in. [,3 mm].

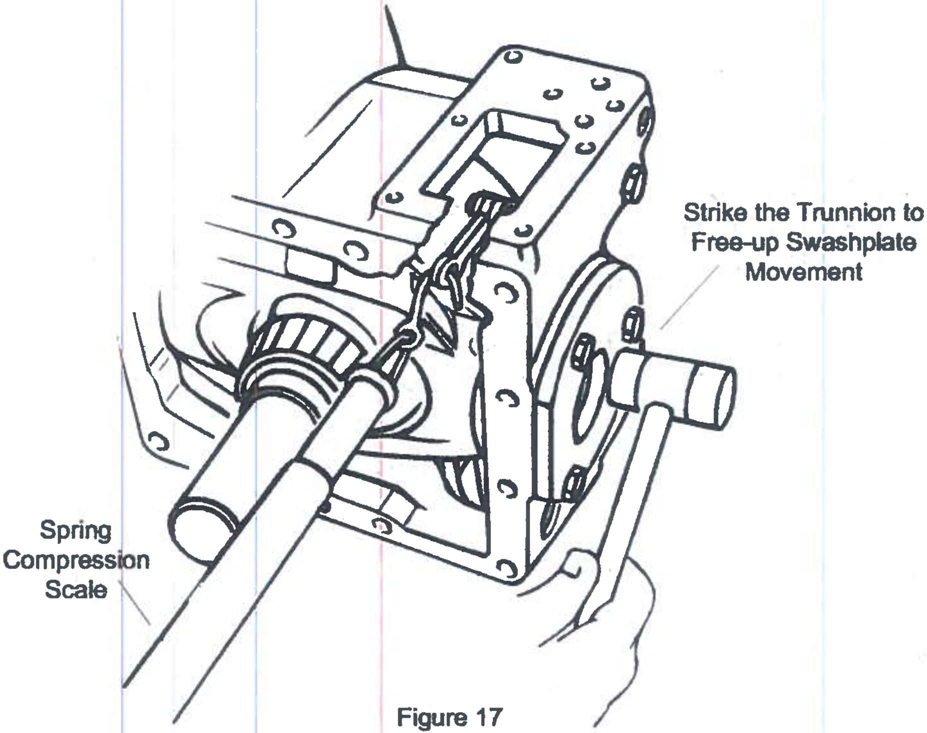


Figure 17

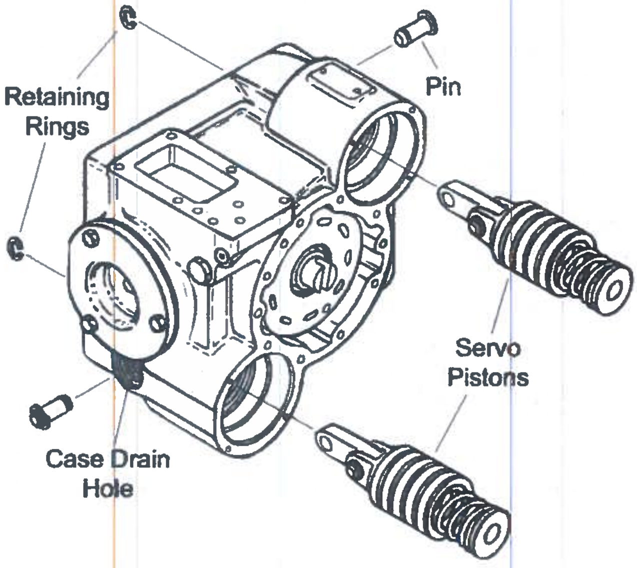


Figure 18

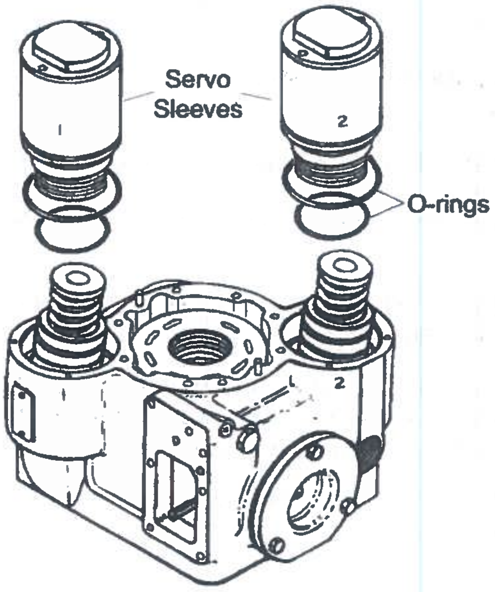


Figure 19

64 Install the servo pistons. Line up the servo piston links and install the pins through the case drain holes as shown in figure 18.

65 Carefully remove the shaft and bearing assembly. Reposition the pump so it is sitting on the mounting flange gasket surface.

Note: Do not let the cylinder barrel slide off of the pistons.

66 Lubricate and install new o-rings on the servo sleeves.

67 Install each servo sleeve in its original location. Start by lifting one of the servo pistons, tilting the swashplate to its maximum angle, then carefully fit the servo sleeve over the piston. Next, lower the servo sleeve and piston into the pump housing until the threads meet. Finally, screw the servo sleeve in until the scribe marks line up. Repeat this procedure for the second servo sleeve.

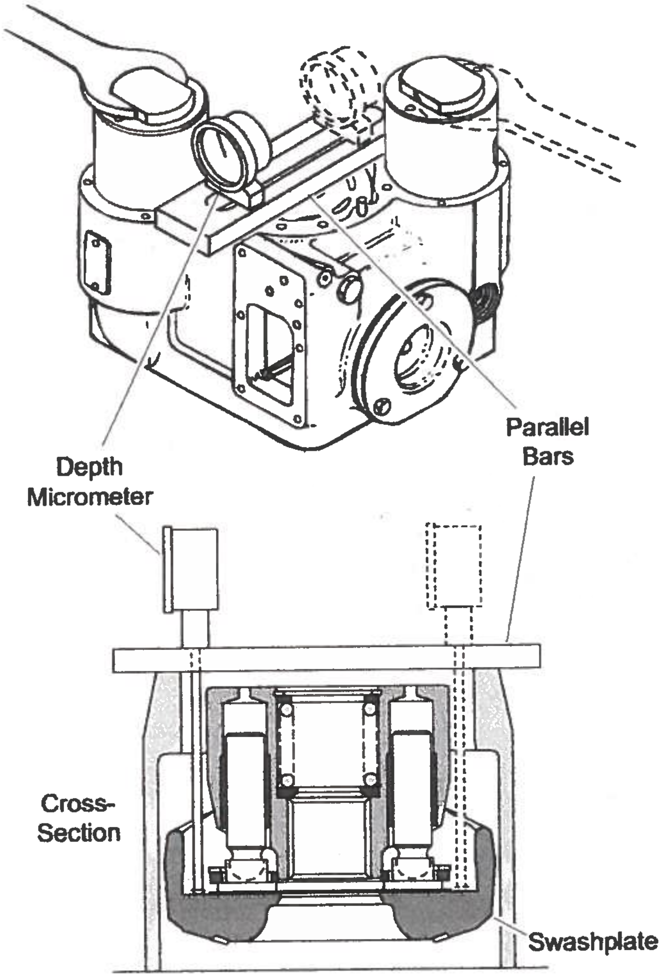


Figure 20

68 Check the zero angle of the swashplate.

Important: Zeroing the swashplate insures that the springs on the servo pistons will return the swashplate to neutral when the control lever is centered.

69 Place parallel bars across the end cover gasket surface and measure the depth to the swashplate on each side of the cylinder barrel, as shown in figure 20.

The maximum allowable difference in the measurements is .0005 inch [,012 mm].

The springs on the servo pistons must hold the swashplate tight; The maximum allowable swashplate rock is .001 inch [,03 mm].

Screw the servo sleeves in or out to adjust the zero angle of the swashplate.

70 Install the servo sleeve retainers and re-stake if necessary.

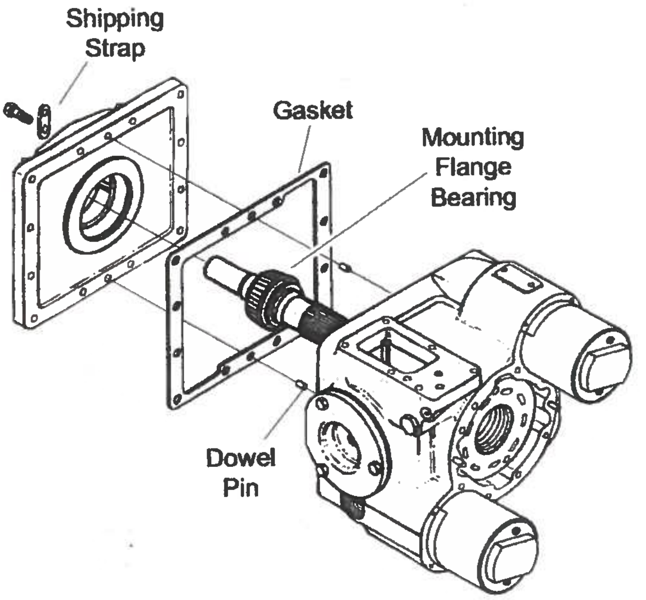


Figure 21

71 Reposition the pump so the control valve mount is on top. Be careful do not let the cylinder barrel slide out off the pump.

72 Carefully slide the shaft and bearing assembly into the pump.

73 Install two dowel pins in the holes in the mounting flange surface of the pump housing.

74 Place a new mounting flange gasket on the pump housing. Hold it in place with petroleum jelly.

75 Lubricate the mounting flange bearing with clean hydraulic fluid

76 Install the mounting flange on the pump.

77 Install the twelve mounting flange bolts. Remember to install the shipping strap. Tighten the bolts to the torque specified in the table below:

Model Number	Mounting Flange Bolt Torque
33, 39, 46	28 lb-ft [38 Nm]
54, 64	44 lb-ft [60 Nm]

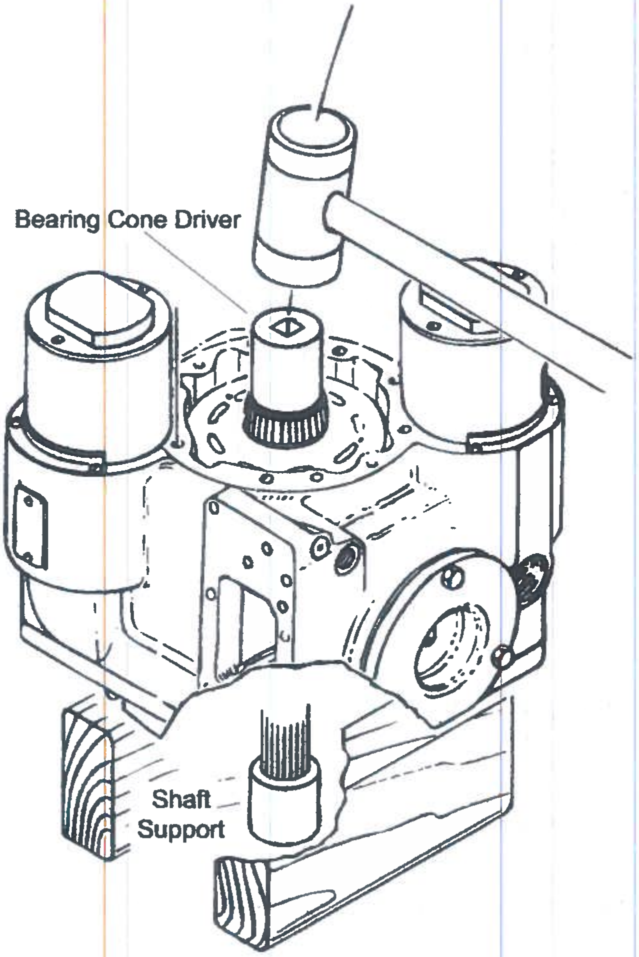


Figure 22

78 Turn the pump over so the shaft is vertical and the mounting flange is down.

79 Support the pump's shaft and use a bearing driver to install the end cover bearing cone, see figure 22. Be sure the bearing cone is seated against the shoulder of the shaft.

Note: A detailed drawing of the bearing cone driver is shown in Appendix E of this manual.

80 Remove the shaft support.

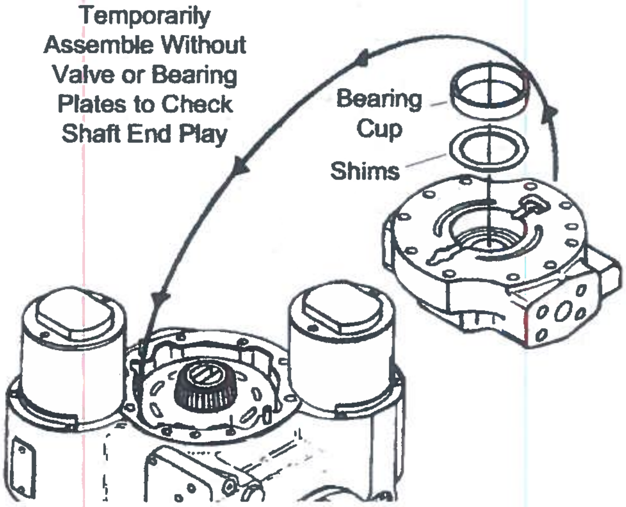

Temporarily Assemble Without Valve or Bearing Plates to Check Shaft End Play
Bearing Cup
Shims

Figure 23

81 Install two dowel pins in the holes in the end cover surface of the pump housing.

82 Install a new end cover gasket.

83 Check the pump shaft end play before installing the bearing and valve plates.

Be sure the bearing cup and shims are in the end cover and place it on the pump.

Install the eight end cover bolts and tighten them alternately to the torque specified in the table below:

Model Number	End Cover Bolt Torque
33, 39, 46	39 lb-ft [53 Nm]
54, 64	63 lb-ft [85 Nm]

Turn the pump over so the mounting flange and shaft are on top. Place a block of wood under the end cover so the weight of the pump is not on the servo sleeves.

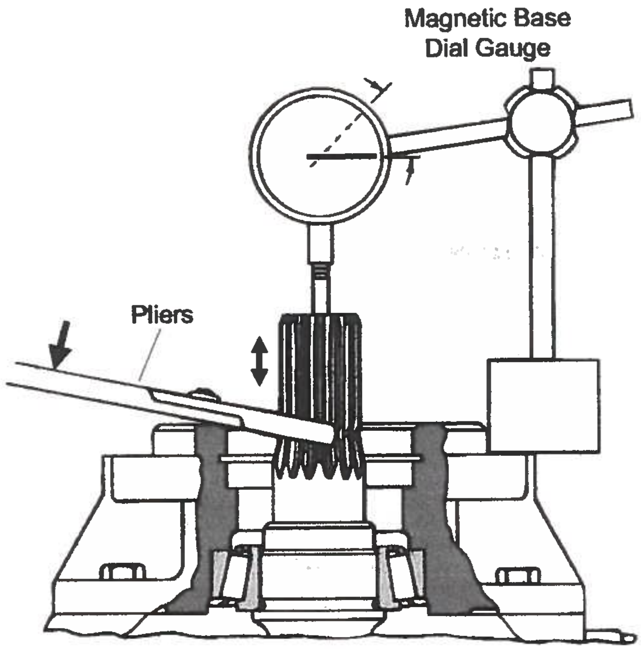


Figure 24

Gently tap the shaft into the pump with a plastic hammer to seat the bearings.

Place a dial gauge, with a magnetic base over the shaft as shown in figure 24. Grasp the shaft low with a pliers and pry it up to get the end play reading.

The pump shaft end play must be from .002 in. to .007 in. [,05 mm to ,17 mm].

Adjust the end play by adding or subtracting shims from under the end cover bearing cup.

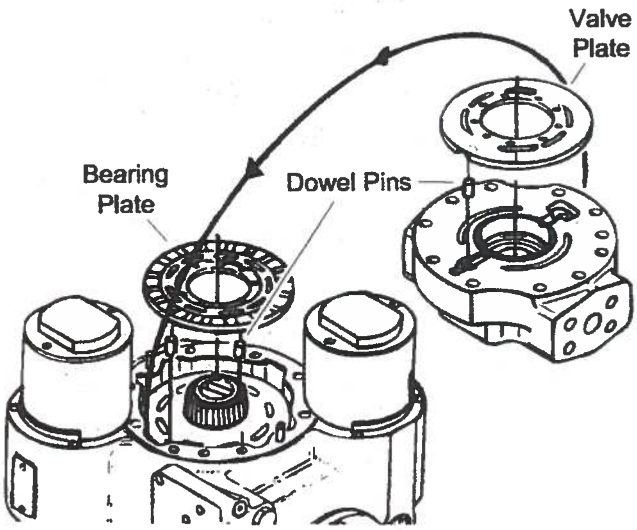


Figure 25

84 Turn the pump over and remove the end cover.

85 Install two dowel pins in the holes in the cylinder barrel face.

86 Place the bearing plate on the cylinder barrel and engage it with the dowel pins.

87 Liberally lubricate the bronze surface of the bearing plate with clean hydraulic fluid.

88 Install a dowel pin in the hole in the end cover.

89 Place the valve plate on the end cover. Be sure it engages with the dowel pin.

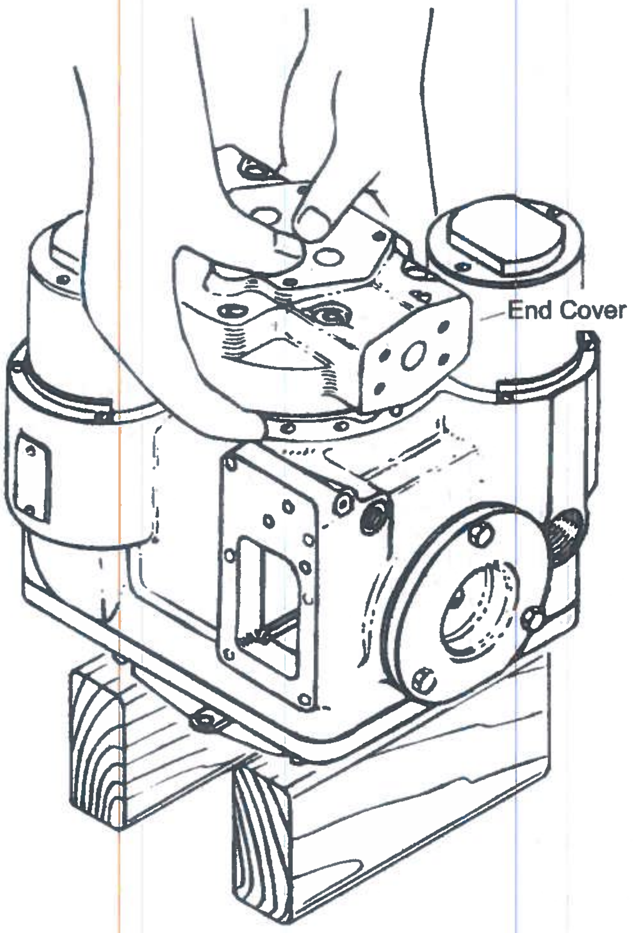


Figure 26

90 Holding the valve plate in place carefully install the end cover.

Note: Use petroleum jelly to help hold the valve plate to the end cover.

91 Install the eight end cover bolts, remember the shipping strap.

92 Tighten the end cover bolts evenly so the cylinder barrel spring pre-load is taken-up gradually. Torque them alternately to the specifications given in the table below:

Model Number	End Cover Bolt Torque
33, 39, 46	39 lb-ft [53 Nm]
54, 64	63 lb-ft [85 Nm]

93 Lubricate and install new o-rings and back-up rings on the check valves. The back-up ring must be installed on the charge pump side of the o-ring, see figure 27.

94 Install the check valves in the pump end cover. Push them down until their tops are flush with the surface of the end cover.

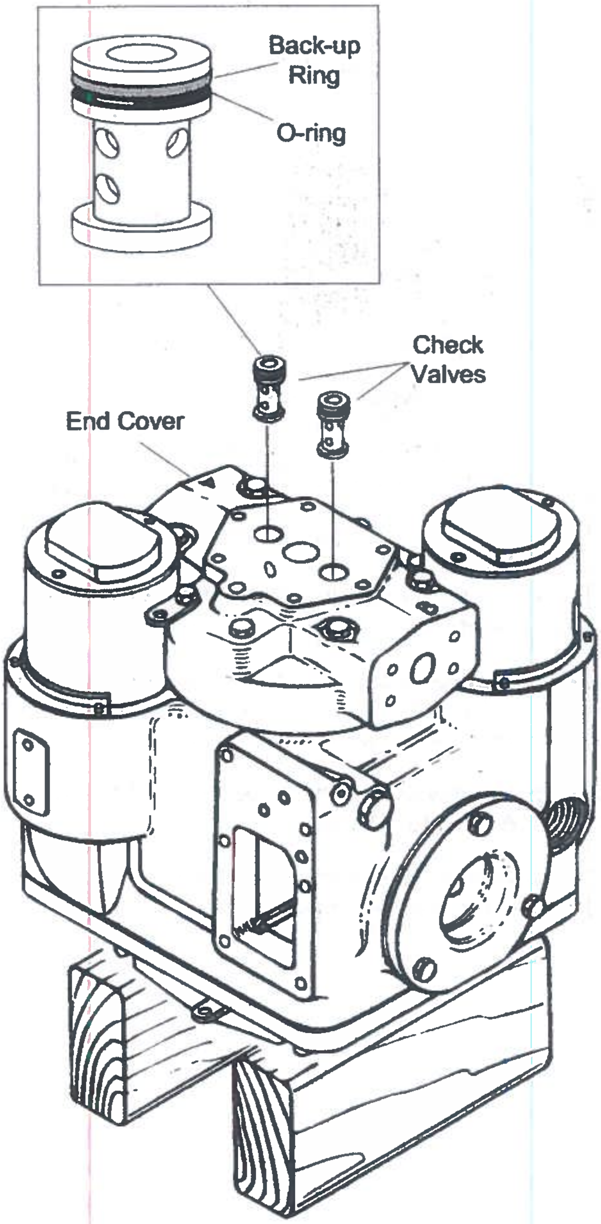


Figure 27

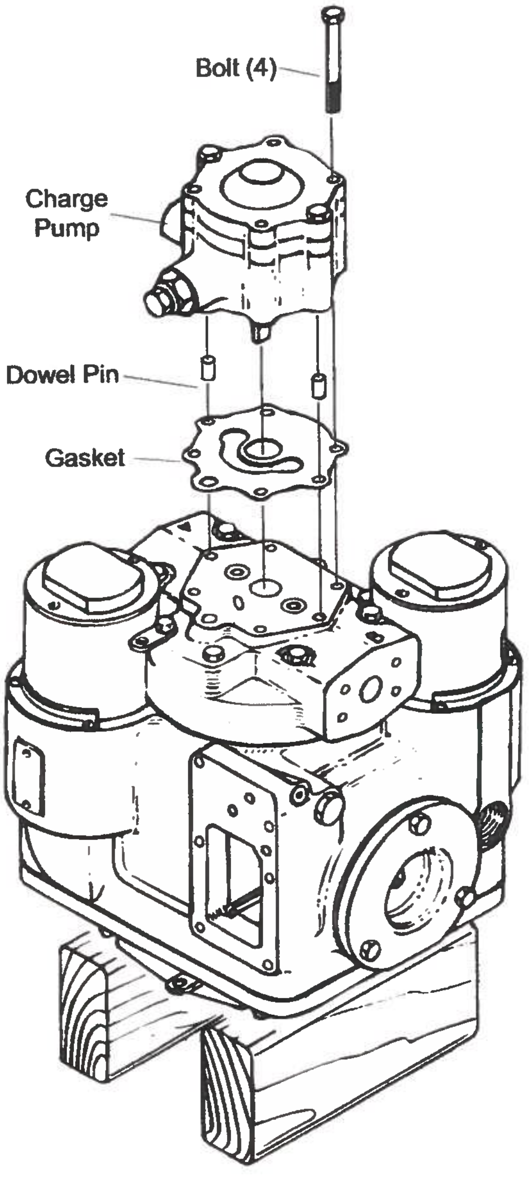


Figure 28

95 Install the two remaining dowel pins in the holes in the end cover, see figure 28.

96 Place a new charge pump gasket on the end cover.

97 Rotate the charge pump shaft so the tang and the dowel pin holes line-up correctly with the pump. Then carefully install the charge pump.

Note: Some charge pumps have splined drives.

98 Install the four hex head bolts that hold the charge pump to the pump end cover. Torque them alternately to 25 lb-ft [34Nm]. Charge pumps that have 'A' or 'B' pads require a torque of 22 lb-ft [30 Nm].

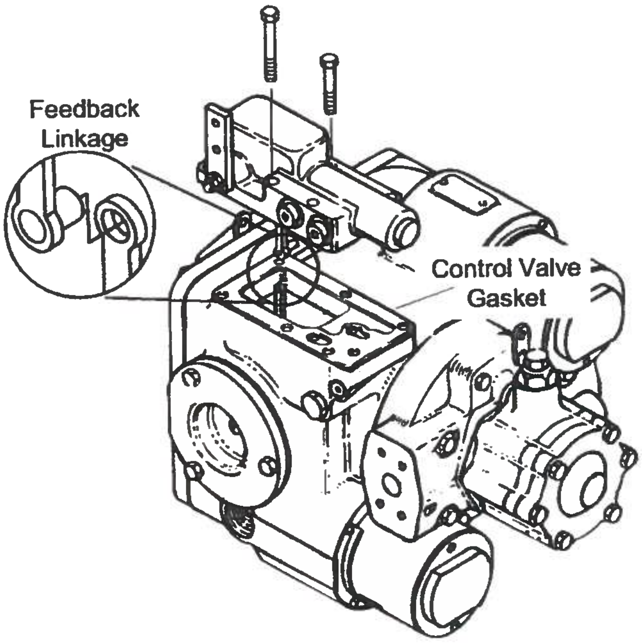


Figure 29

99 Reposition the pump so the control valve mount is on top.

100 Place a new control valve gasket on the pump.

101 Connect the feedback linkage and position the control valve on the pump.

Important: When the control valve is positioned on the pump make sure the feedback linkage points towards the end cover.

102 Install the six hex head bolts and tighten them finger tight.

103 Move the control lever back and forth; it should move freely in both directions and self-center. If it doesn't recheck the feedback linkage.

104 Tighten the six hex head bolts to 16 lb-ft [22 Nm].

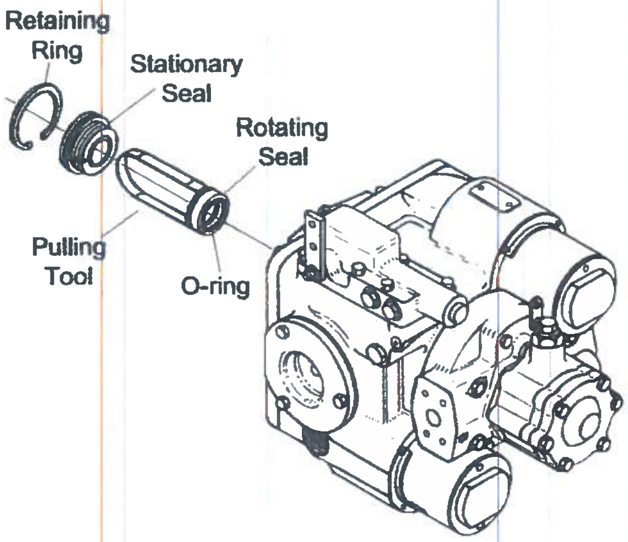


Figure 30

105 Reposition the pump so the shaft seal can be installed.

Note: Eaton recommends replacing the entire shaft seal. Use Shaft Seal Kit P/N 990231.

Important: The metal-to-metal sealing surfaces are critical. Clean the areas of contact with a suitable solvent then blow them dry. The solvent must evaporate without leaving a residue. Do not touch the sealing surfaces after cleaning.

106 Apply petroleum jelly to the o-ring and install it in the rotating seal

107 Apply a light coating of clean hydraulic oil to the cleaned metal sealing surface of the rotating seal.

108 Install the rotating seal using the special pulling tool (CAS 1844).

109 Screw a 3 in. X 1/4-20 bolt into the threaded hole in the new stationary seal. The bolt provides a convenient means for holding the seal.

110 Apply petroleum jelly to the o-ring that is around the largest part of the stationary seal.

111 Apply a light coating of clean hydraulic oil to the cleaned metal sealing surface of the stationary seal.

112 Install the stationary seal.

113 Using the retaining ring pliers install the retaining ring with the beveled side out, be sure that it is seated properly.

Caution: Verifying the accuracy of repairs on an authorized test stand is essential.

Appendix A: IPOR End Cover

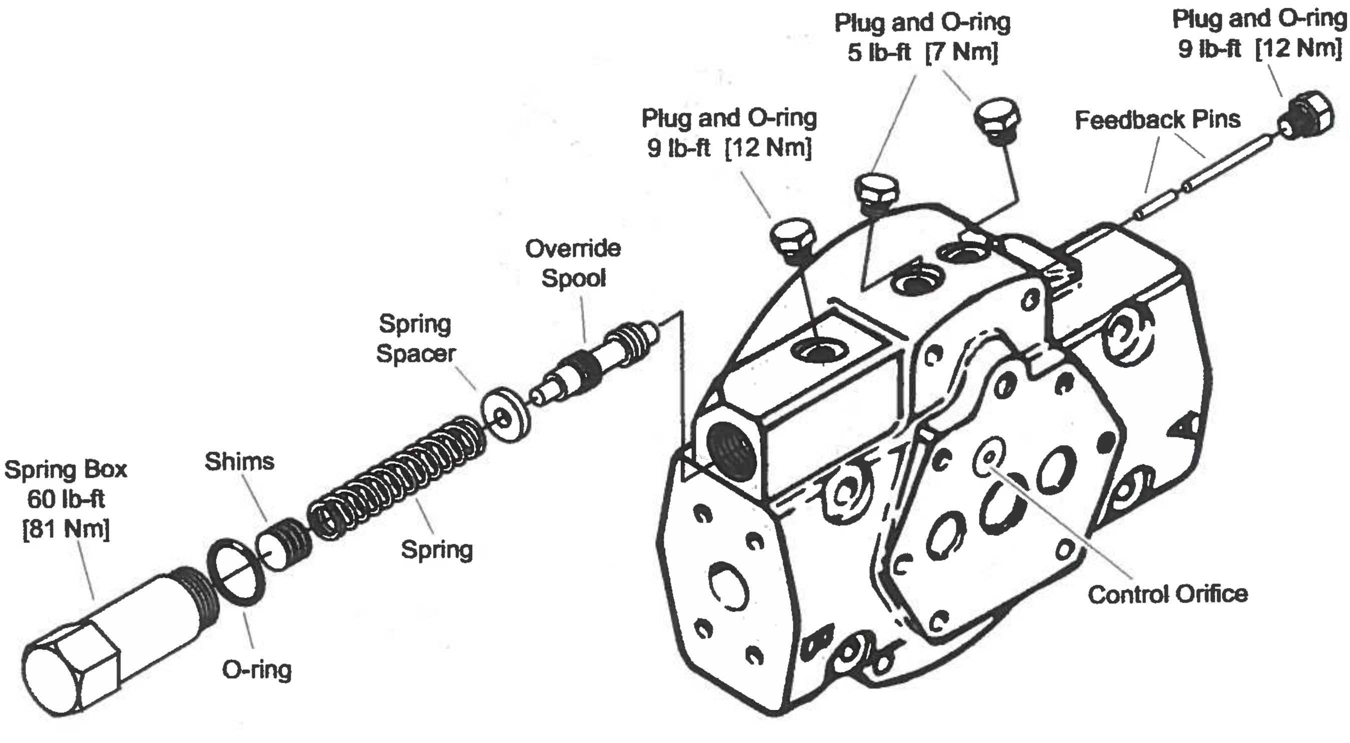


Figure 31

After the end cover has been removed from the pump, disassemble it as shown in figure 31.

Flush the end cover's internal passages and wash the IPOR parts with clean solvent. Blow the parts dry with compressed air.

Inspect the parts and replace any that are worn or damaged.

Inspect the control orifice, see figure 31, if it is plugged after flushing replace it.

To remove the plugged orifice, strike it in the center with a center punch. This will curl the orifice so it can be removed.

Install a new orifice of the same size. The orifice size is stamped on the orifice in thousandths of an inch, example: 57 = .057 in.

Place the orifice in the orifice pocket so the size is visible.

Stake the orifice in six places with a center punch.

Insure that the orifice is properly seated after staking.

Important: Do not flatten and reuse orifices.

Reassemble the end cover. Install new o-rings and torque the plugs and spring box to the specifications given in figure 31.

IPOR Pressure Setting

The IPOR pressure setting is adjusted by adding or removing shims. An .018 inch shim changes the pressure override setting by 500 psi. Shims totaling .125 inch will provide an override setting of approximately 5000 psi. Because of tolerances the actual pressure override must be measured with a gauge while the pump is operating.

Appendix B: Power Limiter Valve End Cover

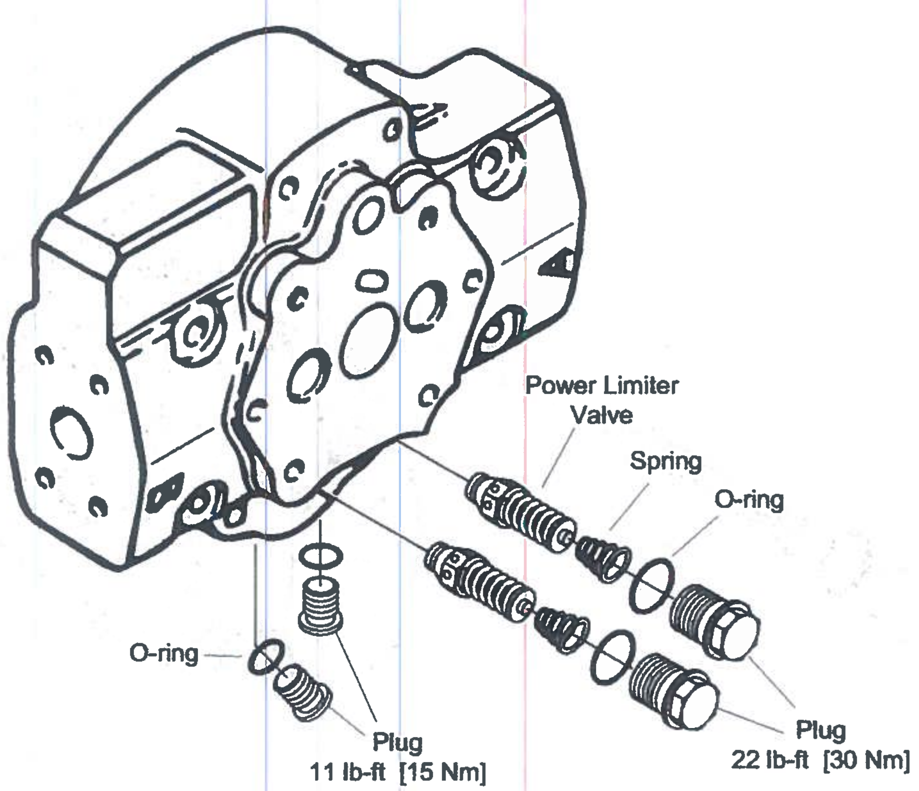


Figure 32

After the end cover has been removed from the pump, disassemble it as shown in figure 32.

Flush the end cover's internal passages and wash the power limiter parts with clean solvent. Blow the parts dry with compressed air.

Inspect the parts and replace any that are worn or damaged.

Reassemble the end cover. Install new o-rings and torque the plugs to the specifications given in figure 32.

Power Limiter Valve Pressure Setting

The pressure setting is stamped on the power limiter valve. If there is a two digit code find the pressure setting in the table. If the power limiter valve has a three digit number, multiply the number by 10 to get the pressure setting, example: 550 = 5500 psi.

Power Limiter Valve Settings	
2 Digit Code	Pressure Setting (psi)
54	4000
59	4500
56	5000
63	5500
21	5800
57	6000

Appendix C: Control Orifice Installtion and Removal

There are two types of control valve orifices: the plate orifice and the plug orifice.

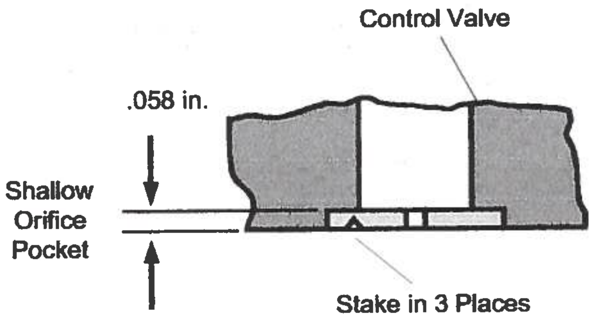


Plate Orifice

The plate orifice is used in control valves that have shallow orifice pockets.

The orifice size is stamped on the orifice in thousandths of an inch, example: 57 = .057 in.

Installation:

Place the orifice in the orifice pocket so the size is visible.

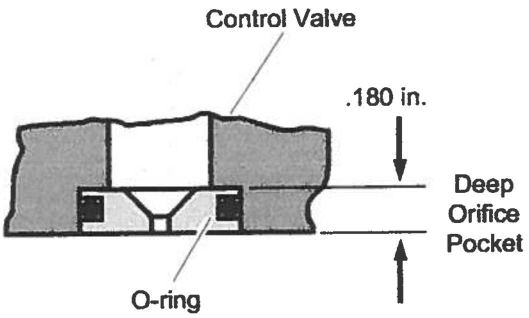
Stake the orifice in three places with a center punch.

Insure that the orifice is properly seated after staking.

Removal:

To remove the plate orifice, strike it in the center with a center punch. This will curl the orifice so it can be removed.

Important: Do not flatten and reuse orifices.



Plug Orifice

The plug orifice is used in control valves that have deep orifice pockets. The plug orifice replaces the hat orifice.

Installation:

Before installing the plug orifice be sure that the o-ring is in place. Apply petroleum jelly to the edge of plug orifice and o-ring.

Carefully insert the plug orifice into the orifice pocket. The large opening in the plug must go into the control valve.

Removal:

To remove the plug orifice, insert a stiff wire, that has been bent to form a hook, through the orifice hole. Hook the inside of the plug orifice and pull it out of the pocket.

Important: Removing the orifice may damage it, so do not reuse orifices.

Appendix D: Charge Pump Repair

Charge Pump Displacement (cu.in./rev)	Spacer Thickness (inches)
.85	.5
1.28	.75
1.70	1

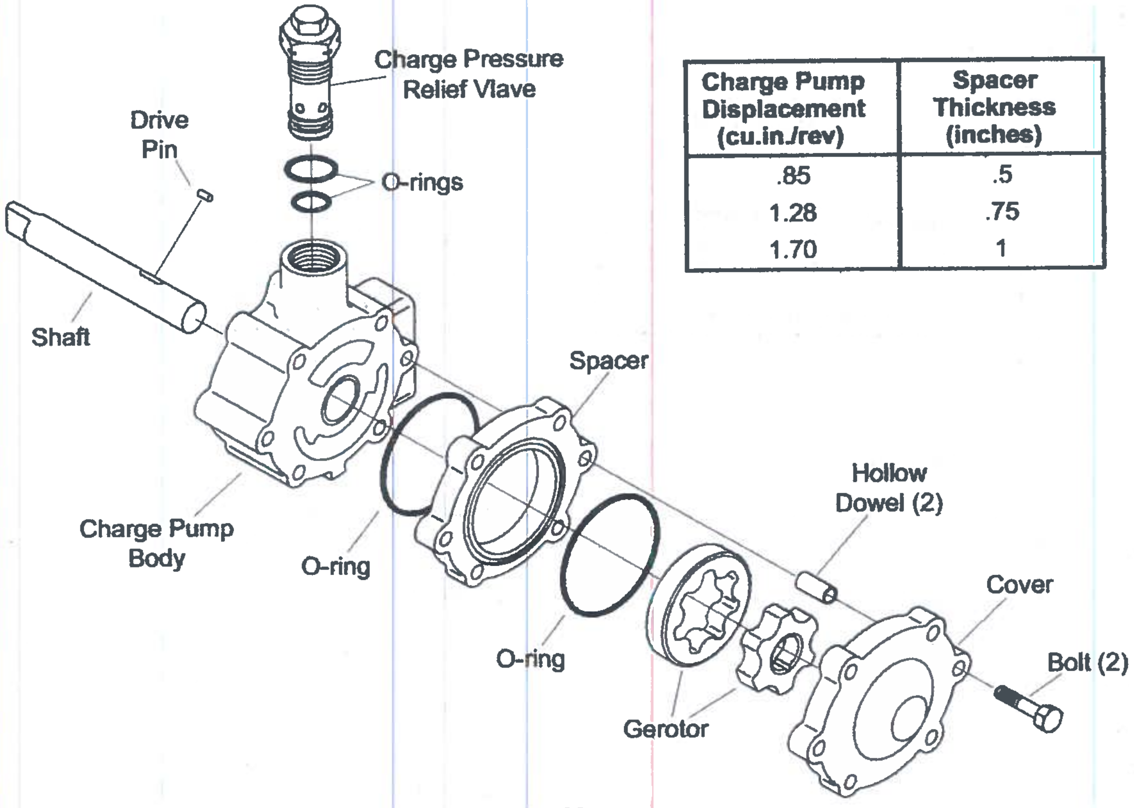


Figure 33

Disassemble the charge pump by removing the two bolts that hold it together, as shown in figure 33.

Note: Figures 33 and 34 show a standard charge pump. The repair procedures given here apply to optional charge pumps too.

Wash the parts in clean solvent and blow them dry with compressed air.

Inspect the parts and replace any that are worn or damaged.

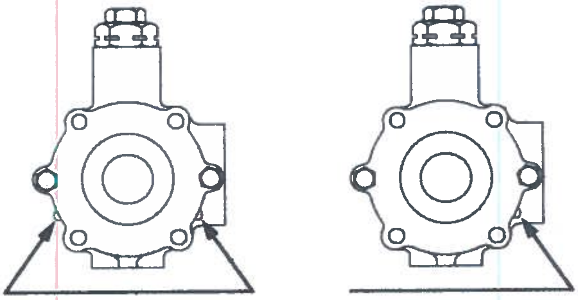
The three digit number stamped on the charge pressure relief valve indicates its pressure setting. Multiply this number by ten to get the pressure setting in PSI. Example: 022 = 220 PSI.

Assemble the charge pump using new o-rings. Lubricate the o-rings with petroleum jelly before assembly. Apply a coating of clean hydraulic fluid to the gerotor to provide start up lubrication.

Tighten the two bolts that hold the charge pump together to 17 lb-ft [23 Nm]. Tighten the charge pressure relief valve to 80 lb-ft [108 Nm].

Important: The charge pump's rotation direction must match the rotation direction of the pump.

The charge pump's rotation direction can be identified by checking the alignment of the beads on the pump body and spacer. Figure 34 summarizes charge pump rotation identification.



Clockwise rotation: bead on spacer and bead on pump body not aligned.

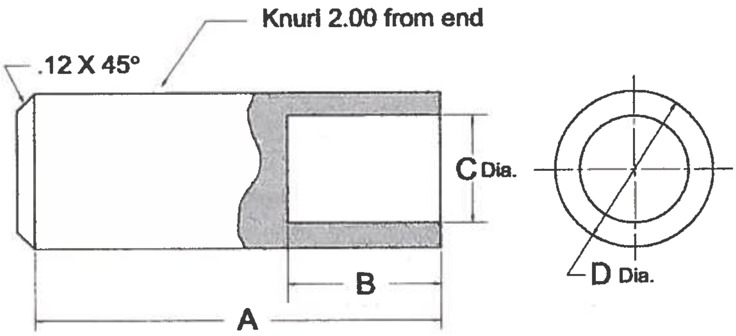
Counterclockwise rotation: bead on spacer and bead on pump body aligned.

Figure 34

Appendix E: Special Tools

(All dimensions are given in inches.)

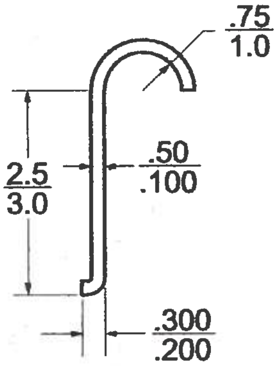
Bearing Cone Drive



Model	A	B	C	D
33, 39, 46	4.0	1.5	1.01	1.25
54, 64	4.0	1.5	1.25	1.48

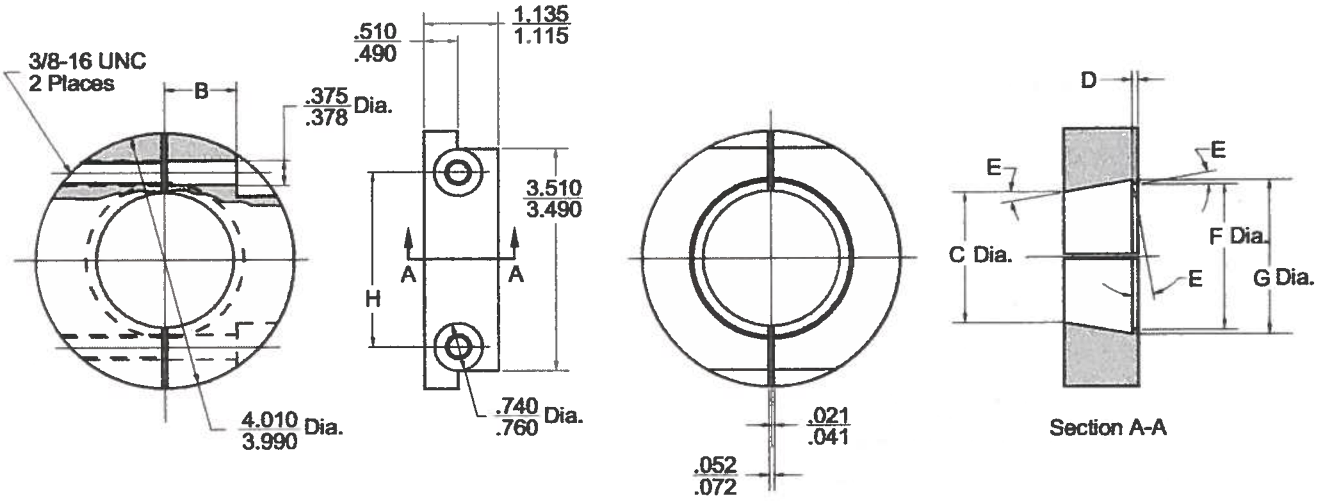
Material / Heat Treatment; C.R.S. / 50-55 Rc

Check Valve Puller



Material - Steel

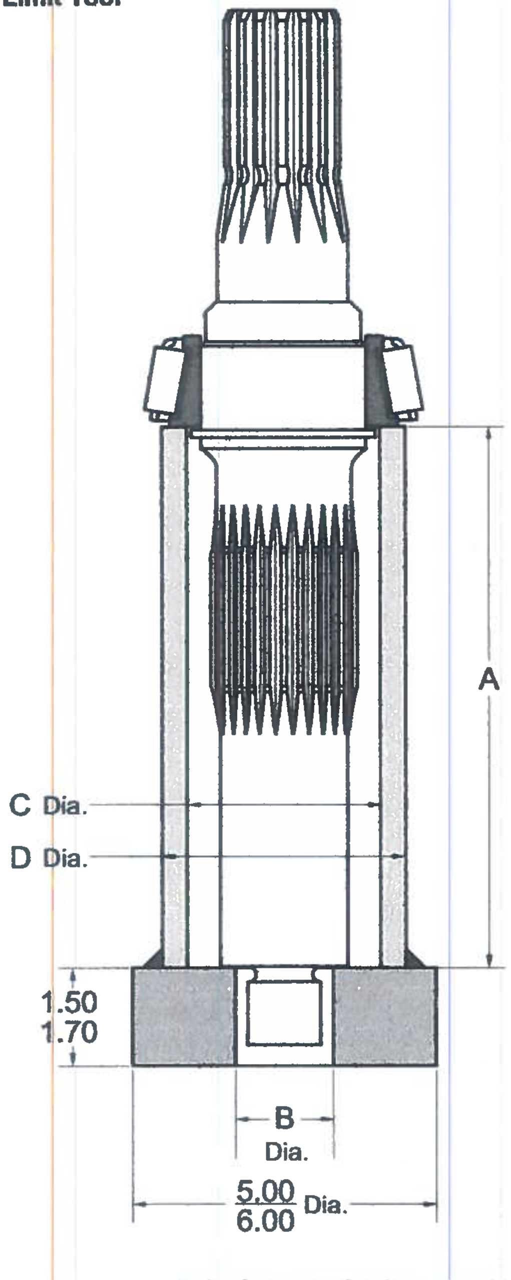
Low Clearance Bearing Puller



Model	B	C	D	E	F	G	H
33, 39, 46	1.050 1.070	1.565 Ref.	1.35 1.29	13°	1.907 1.913	2.020 2.026	2.622 2.628
54, 64	1.115 1.135	1.603 Ref.	.141 .135	20°	2.223 2.229	2.318 2.324	2.747 2.753

Material / Heat Treatment; Stentor / 45-55 Rc

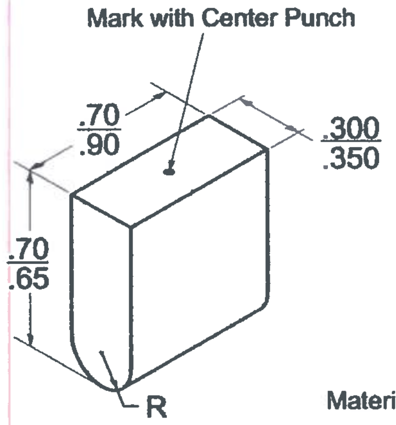
Stop Limit Tool



	Model	
	33, 39, 46,	54, 64
A ±.001	5.803	6.682
B	1.00 1.20	1.30 1.32
C	2.20 2.30	2.20 2.30
D	3.00 min.	3.00 min.

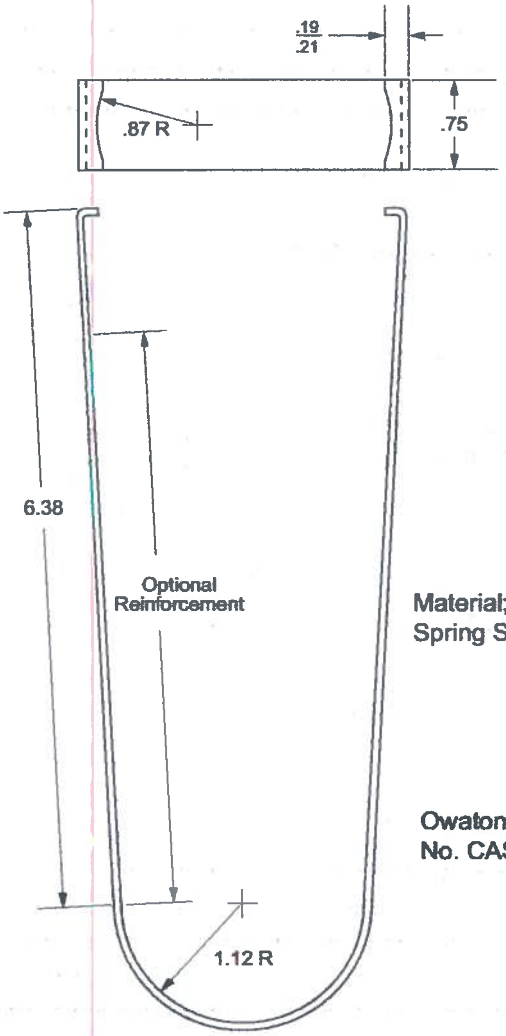
Material - Steel

Shaft End Spacer



Material - Steel

Rotating Seal Puller



Material; SAE 1074
Spring Steel 16 Ga.

Owatonna Tool Co.
No. CAS 1844

Hydraulic Fluid Recommendations

A reputable supplier can help you make the best selection of hydraulic fluid for use in Eaton hydrostatic products.

For satisfactory operation the following recommendations apply:

1. The filter system used in the hydraulic circuit should be capable of cleaning and maintaining the hydraulic fluid to meet ISO Cleanliness Code 18/13 per SAE J1165. This code allows a maximum of 2500 particles per milliliter greater than 5 µm and a maximum of 80 particles per milliliter greater than 15 µm.
2. At normal operating temperatures optimum viscosity ranges from 80-180 SUS (16-39 cSt). Viscosity should never fall below 60 SUS (10 cSt) and, at the lowest expected start-up temperature, should not exceed 10,000 SUS (2158 cSt).
3. The fluid should be chemically stable, incorporating rust and oxidation inhibitors.

Specific types of fluid that meet these requirements are:

- Premium quality, industrial anti-wear type hydraulic fluid
- Engine crankcase oil — SAE 10w, SAE 20w-20, SAE 30
- Automatic transmission oil
- Hydraulic transmission oil
- Synthetic fire resistant fluid — Quintolubric, Cosmolubric, or equivalent

Note: If the natural color of the fluid has become black or milky it is possible that an overheating or water contamination problem exists.

Take level readings when fluid is cold.

Information contained in this catalog is accurate as of the publication date and is subject to change without notice. Performance values are typical values. Customers are responsible for selecting products for their applications using normal engineering methods.

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March, 1995

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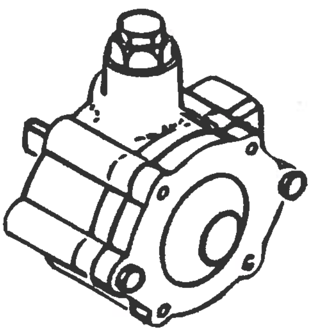
No. 7-607

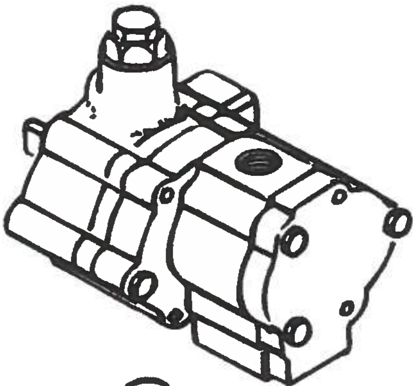
**Eaton
Hydrualics
Division**

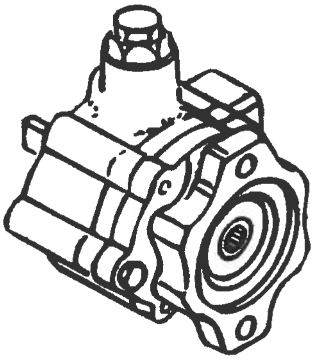
Repair Information

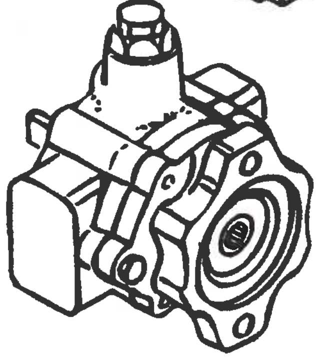
Eaton Hydrostatic Transmission – Charge Pumps

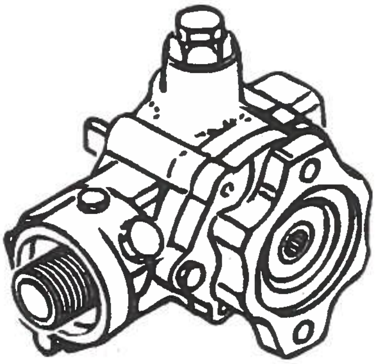
for Models 33 thru 76

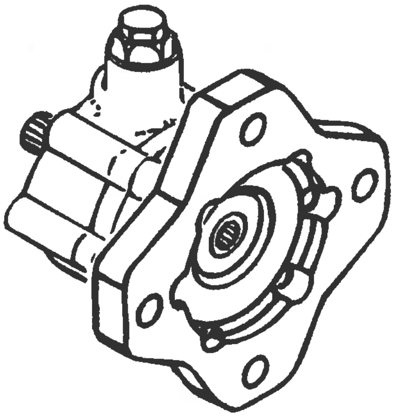












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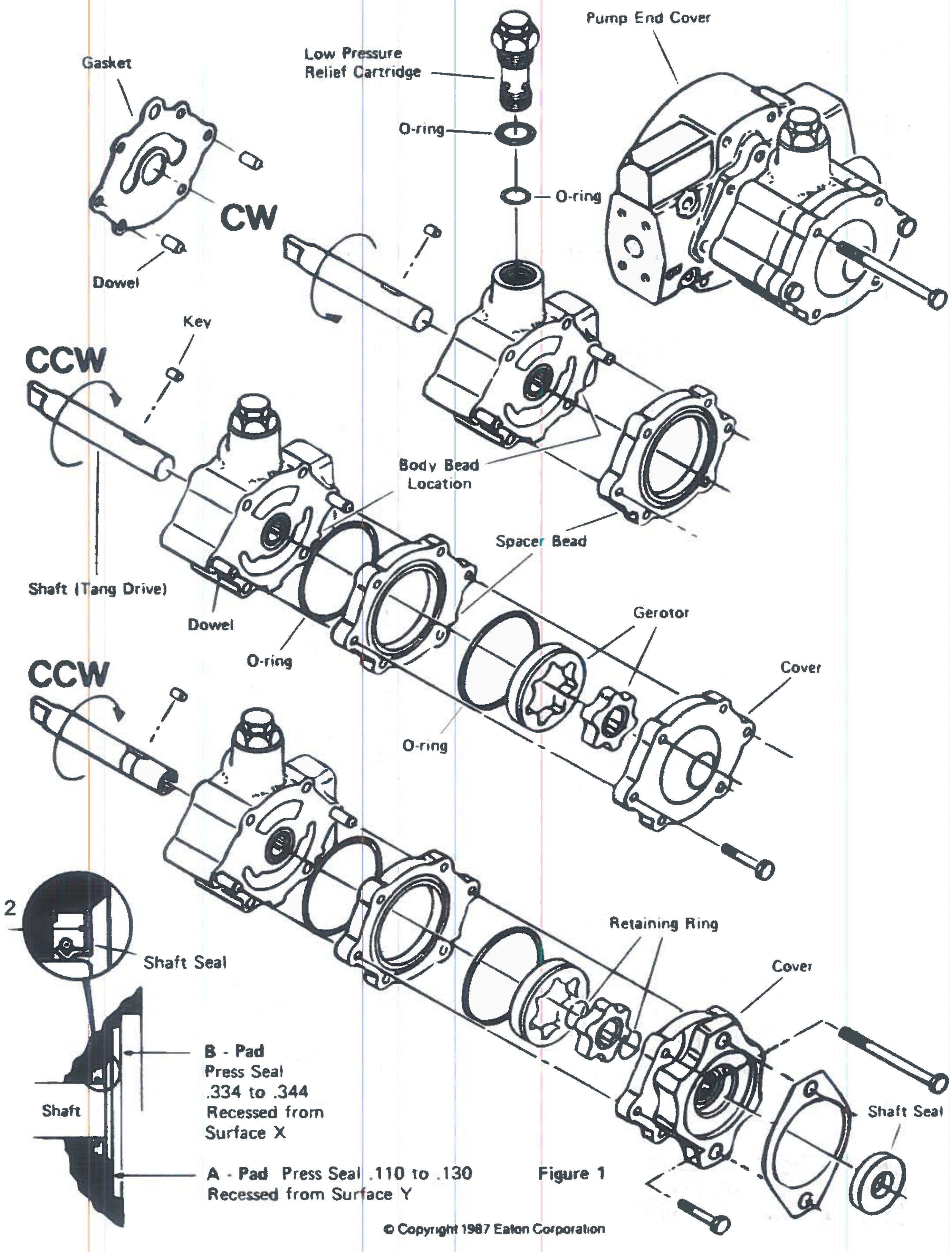


Figure 1

© Copyright 1987 Eaton Corporation

Disassembly

1 Remove the low pressure relief valve cartridge. Remove the o-rings from the valve and discard. Further disassembly of the relief valve is not usually necessary and is not recommended.

Maximum Pressure Setting identifications:
The charge pressure relief valves are factory preset. The pressure code us stamped on the hex plug located on the end of the valve cartridge. to determine the pressure setting, add a zero to the right of the stamped number.

System Pressure Examples
022 = 220 PSI Setting [15 Bar]
034 = 340 PSI Setting [23 Bar]

2 Loosen all cap screws.

3 Remove only the four corner cap screws.

4 Remove the entire charge pump assembly from the pump end cover. Remove the gasket and two dowels from the body if they did not remain in the end cover.

5 To disassembly the charge pump assembly, remove the two remaining cap screws.

6 Remove the cover. The A and B Pad charge pumps have a seal in the cover. If you are repairing the charge pump, remove the shaft seal from the cover. If you are only changing the rotation, there is usually no need to remove the seal.

7 Remove the shaft and key. On the A and B Pad charge pumps, retaining rings hold the inner gerotor star to the shaft.

8 Remove the gerotor.

9 Remove the spacer.

10 Remove the o-rings from the spacer and discard them.

11 Remove the two hollow dowels from the spacer.

Reassembly

1 Install the hollow dowels in the body.

2 Lubricate and install the new o-rings in the spacer.

3 Install the spacer per the desired rotation. Refer to figure 1. For counterclockwise (CCW) rotation, align the beads on the spacer and body. For clockwise (CW) rotation, do no align the beads on the spacer and body.

4 Install the gerotor into the spacer.

Note: On the A and B Pad charge pumps, retaining rings hold the inner gerotor star to the shaft.

5 Install the key in the keyway, aligning the key with the rounded notch in the gerotor star.

6 Install the shaft in the gerotor.

7 If the shaft seal was removed, install the new seal in the cover counterbore with the lip of the seal facing inward. On the A Pad charge pump, press the seal into the counterbore until it is recessed .110 to .130 inch [2,7 to 3,3 mm] from the Y surface (see illustration). On the B Pad charge pump, the seal must be recessed .334 to .344 inch 8,5 to 8,7 mm] from the X surface.

8 Install the cover. The larger kidney cast in the cover must face the inlet. To prevent misassembly, the bolt holes in the cover, spacer section and body are not symmetrical.

9 Install the two cap screws that retain the charge pump assembly. Torque them to 16 lb-ft [22 N·m].

10 Install the gasket and solid dowels in the end cover, if they were removed.

11 Install the charge pump on the main pump, aligning the charge pressure drain port and also aligning the tank on the charge pump shaft with the slot in the main pump shaft.

Note: Pad B charge pumps use a splined drive rather than a tang drive.

12 Install the four corner cap screws and torque to 16 lb-ft [22 N·m].

Dual Element Charge Pump

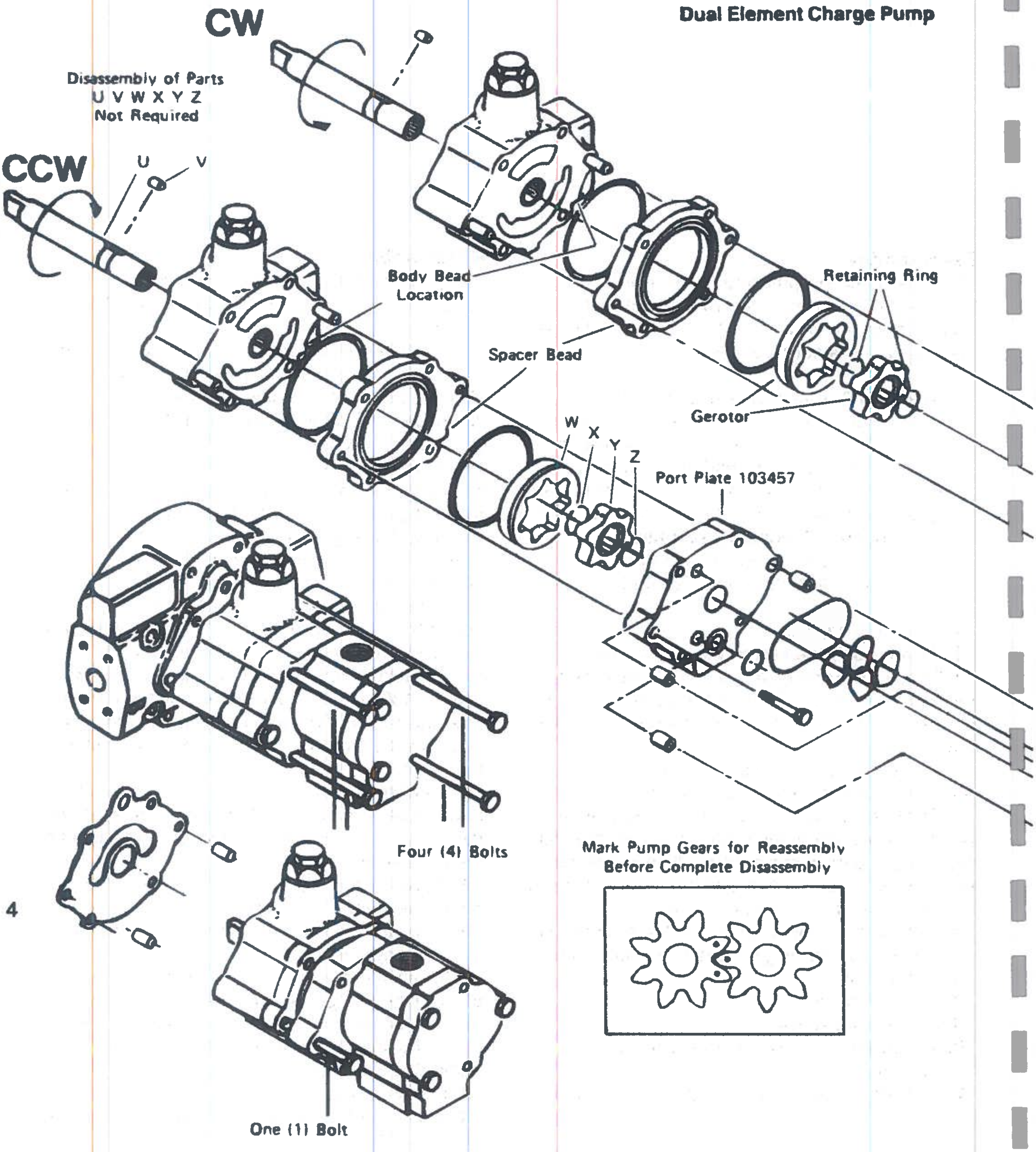
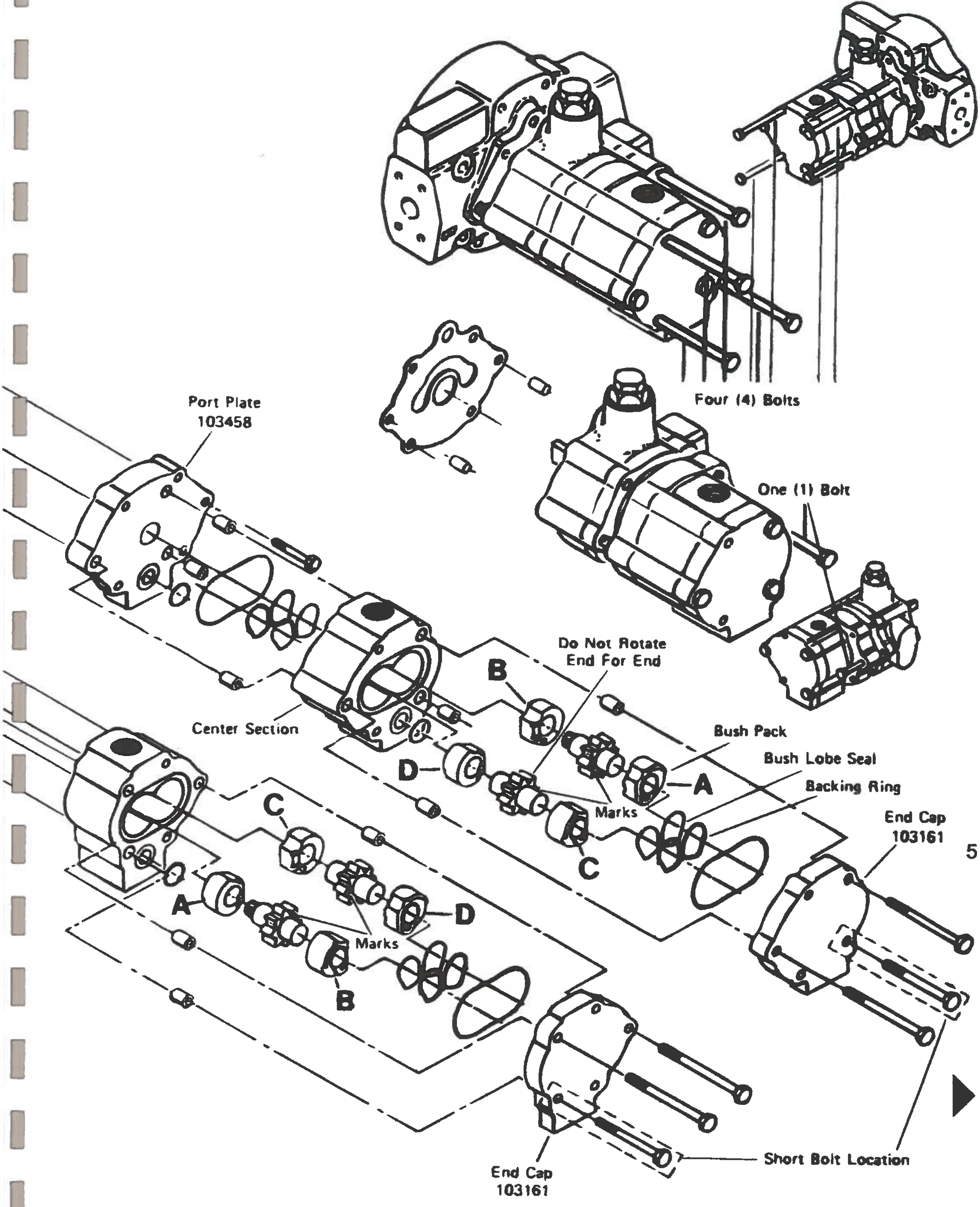


Figure 2


Four (4) Bolts
Port Plate
103458
One (1) Bolt
Do Not Rotate
End For End
B
Bush Pack
Center Section
D
A
Bush Lobe Seal
Marks
Backing Ring
C
End Cap
103161
C
5
A
D
Marks
B
Short Bolt Location
End Cap
103161

Disassembly - Dual Element Charge Pump

1 Remove the four mounting bolts that run through the standard charge pump (front section) and the rear pump (rear section).

2 Remove the single bolt holding the rear pump to the standard charge pump. Remove the rear pump.

3 Remove the three end cover bolts.

4 Remove the end cover.

5 Remove the o-ring, backing ring and bush lobe seals.

6 Mark the bush packs and gears for correct reassembly. The same bush packs must remain with the same gears because of the wear pattern. Remove the bush packs.

7 Remove the center section from the port plate.

8 Remove the hollow dowels from the center section.

9 Remove the o-ring, backing rings and bush lobe seal from the other side of the center section.

10 Remove the bush packs and driven and drive gears from the center section. The drive gear has a splined shaft.

Reassembly

1 Reassembly the charge pump, aligning the charge pump spacer for the desired rotation. Note: Instructional information Form No. 2-600 describes rotation change procedure.

2 Install the hollow dowels in the center section of the rear pump. Make sure this side of the center section faces the port plate.

3 Install the bush packs in the center section. The same bush packs must stay with the same gears because of the wear pattern. The bush pack opening must face the outlet side of the center section.

4 Install the bush lobe seals, backing ring and o-ring on the side of the center section facing the port plate.

5 Install the driven and drive gears.

6 Install the last two bush packs. Once again, the bush pack opening must face the outlet side of the center section.

7 Install bush lobe seals, backing ring and o-ring.

8 Install the end cover.

9 install the three end cover bolts.

10 Install the rear pump on the charge pump. Install the bolt that holds the rear pump to the charge pump. Tighten it 22 to 24 lb-ft [2,5 to 2,7 N·m] for dry threads and 20 to 22 lb-ft [2,3 to 2,5 N·m] for lubricated threads.

11 Install the four mounting bolts that run through the charge pump and rear pump. tighten them 22 to 23 lb-ft [2,5 to 2,7 N·m] for dry threads and 20 to 22 lb-ft [2,3 to 2,5 N·m] for lubricated threads.

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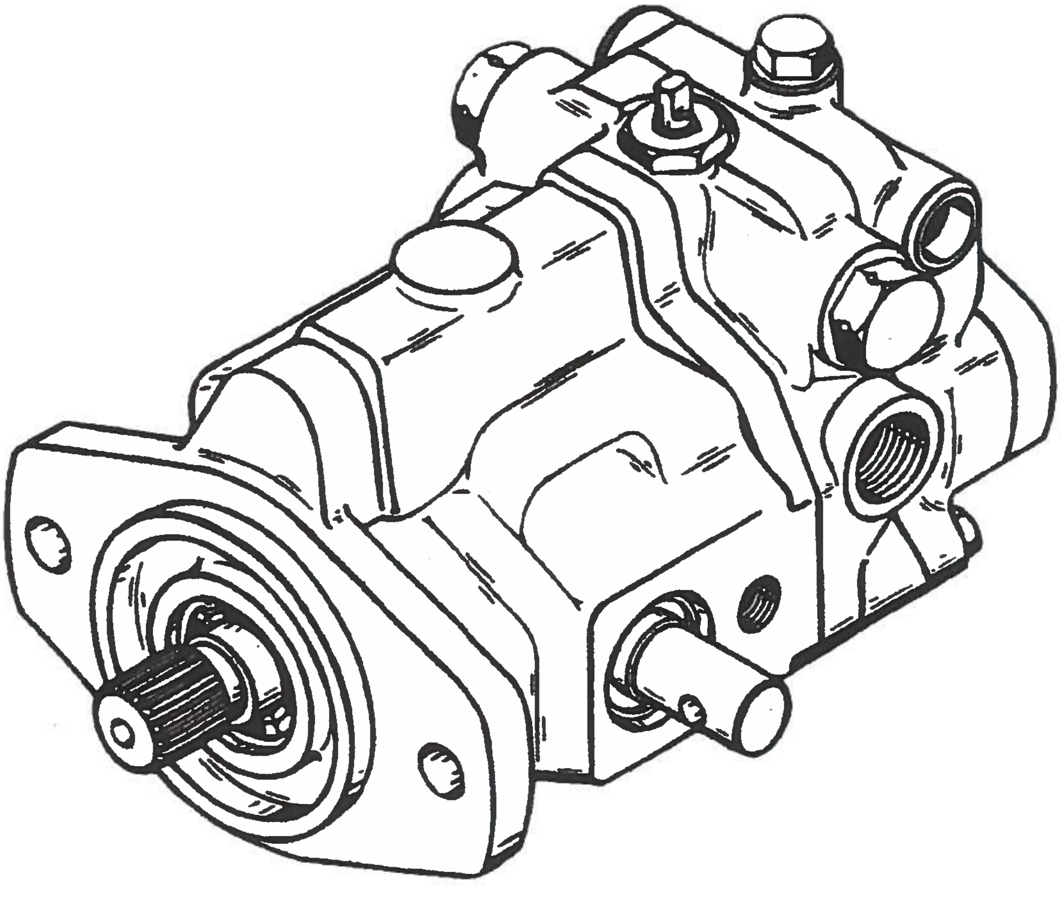
Repair Information

Model 70442 Propulsion Piston Pumps



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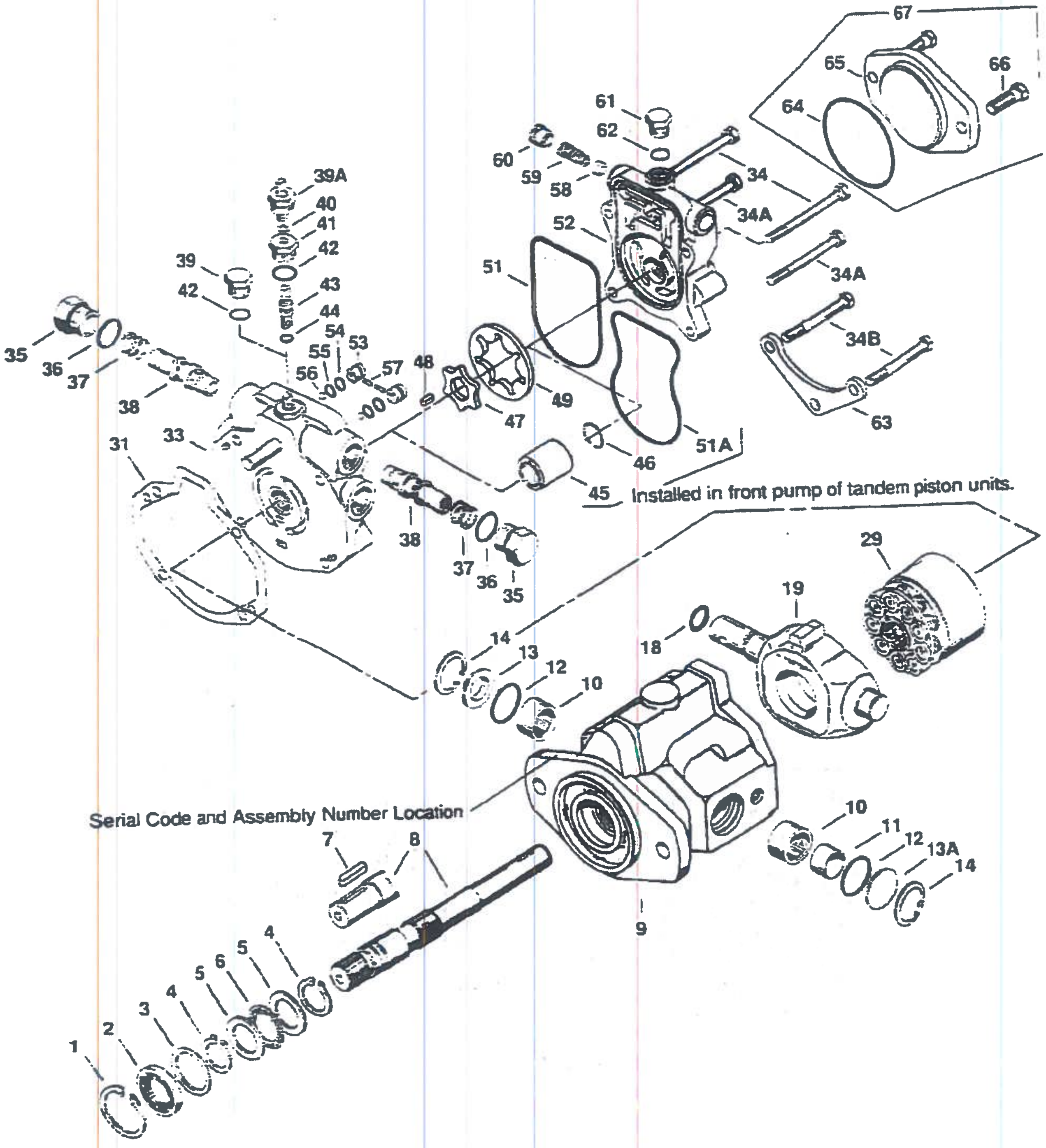
Parts Drawing


Installed in front pump of tandem piston units.

Serial Code and Assembly Number Location

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Parts List

	Item No.	Description	Qty
+	1	Retaining Ring	1
+	2	Shaft Seal	1
	3	Washer	1
+	4	Retaining Ring	2
	5	Bearing Race	2
	6	Bearing	1
	7	Key	1
	8	Drive Shaft	1
	9	Housing Assembly	1
	10	Bearing	2
	11	Inner Race	1
+	12	O-ring, 3/32 in. x 1-7/16 in. I.D. [2,38mm x 36,5mm I.D.]	2
	13	Sleeve Cover	1
	13A	Trunnion Cover	1
	14	Retaining Ring	2
+	18	O-ring, 3/32 in. x 13/16 in. I.D. [2,38mm x 20,64mm I.D.]	1
	19	Camplate	1
	29	Rotating Kit Assembly	1
	31	Housing Gasket	1
	33	Backplate Assembly	1
	34	Cap Screws	2
	34A	Cap Screws	2
	34B	Cap Screws (used w/mounting bracket)	2
	35	Plug Assembly	2
+	36	O-ring, in. 3/32 in. x 7/8 I.D [2,38mm x 22,23mm I.D.]	2
	37	Spring	2
	38	Relief Valve Assembly, 5000 P.S.I. [345 bar]	2
	39	Plug Assembly	1
	39A	Tow Valve Assembly	1

	Item No.	Description	Qty
+	40	Retaining Ring	1
	41	Separator Plug	1
+	42	O-ring, 3/32 in. x 3/4 in. I.D. [2,38mm x 19,05mm I.D.]	1
	43	Spreader	1
+	44	O-ring, 1/16 in. x 3/8 in. I.D. [1,59mm x 9,53mm I.D.]	1
	45	Coupler	1
	46	Lock Ring	1
	47	Inner Gerotor	1
	48	Key	1
	49	Outer Gerotor Ring	1
+	51	O-ring, Molded	1
+	51A	O-ring, Molded	1
	52	Adaptor Assembly	1
	53	Check Valve Assembly	2
+	54	Back-up Washer	2
+	55	O-ring, 1/16 in. x 7/16 in. I.D. [1,59mm x 11,11mm I.D.]	2
	56	Steel Ball	2
	57	Pin	2
	58	Poppet Filter Relief	1
	59	Spring	1
	60	Spring Retainer	1
	61	Plug Assembly	1
+	62	O-ring, 3/32 in. x 41/64 in. I.D. [2,38mm x 16,27mm I.D.]	1
	63	Mounting Support Bracket	1
+	64	O-ring, 1/16 in. x 3-1/4 in. I.D. [1,59mm x 82,55mm I.D.]	1
	65	Cover Plate	1
	66	Cap Screw	2
	67	Cover Plate Kit	1
	S	Seal Repair Kit (70442-932)	1

Tools Required for Disassembly and Reassembly

- 9/16 in. Socket
- 1 in. Socket
- 1 1/8 in. Socket
- Ratchet Wrench
- Torque Wrench (100 lb-ft)
- 7/16 in. Hex Key(Allen)
- 9/16 End Wrench
- Soft Face Hammer
- Internal Retaining Pliers (straight .090 Tip)
- External Retaining Pliers (straight .070 Tip)
- Regular or Locking Pliers
- Seal Diver or Similar Tool
- Petroleum Jelly (Such as Vaseline)

Repair Infomation - Model 70442

Cleanliness is extremely important when repairing these pumps. Work in a clean area. Before disconnecting the lines, clean port area of pump. Disconnect hydraulic lines. Remove pump assembly from vehicle and plug ports. Thoroughly clean the outside of pump. After cleaning, remove port plugs and drain oil.

Disassembly

1 Clamp the end of the drive shaft in a protected jaw vise with the body of the pump up and remove the four cap screws (34) from the pump assembly.

2 Use a plastic mallet and tap the adapter assembly (52) to loosen it, then pull the adapter straight up until it is free.

3 Remove retainer (60), spring (59), and poppet (58) from adapter assembly.

4 Remove the two check valve assemblies (53) from backplate (33). Pin (57) is a loose fit. Caution must be taken when removing check valve assembly so that pin (57) and ball (56) are not lost.

5 Remove outergerotor (49),inner gerotor (47),and key (48) from backplate (33). From front pump of tandem remove coupler (45) and lock ring (46).

6 Use screw driver slots in housing and pry up on backplate (33) or tap with plastic mallet to loosen, then pull the backplate straight up to remove. Remove gasket (31).

7 Remove tow valve assembly (39A) or plug (39) from backplate. Remove retaining ring (40) from spreader (43), and pull spreader from spreader plug (41).

8 Remove plug assembly (35), spring (37), and relief valve assembly (38).

9 Remove pump from vise and remove rotating assembly (29) from pump housing.

10 If pistons (20) did not come with piston block, you may remove them, spider (21), and spider pivot (22). See Figure 1

11 The disassembly of the piston block assembly (23) is not required unless the pins (25) or spring (27) are possibly damaged. See Figure 1

Caution
The following procedure should be used if the spring is to be removed from the piston block. The spring (27) is highly compressed and the retaining ring (28) should not be removed without compressing the spring (27).

The following parts will be needed to disassemble the piston block:

2 ea.	3/8 in. I.D. x 1-1/8 in. O.D. flat washers [9,5mm I.D. x 28,6mm O.D.]
1 ea.	3/8 in. x 3-1/4 in. N.C. cap screw, and [9,5mm x 82,6mm N.C.]
1 ea.	5/16 in. N.C. nut [7.9mm]

Place one of the flat washers over the 3/8 X 3-1/4 cap screw and place this through the center of the piston block. Place the other washer over the cap screw and let it rest on the three pins. Screw the nut on and compress the spring inside the piston block. Use a pair of retaining ring pliers and remove the internal retaining ring. Remove the nut, bolt, and the two washers. Remove the washer (26), spring (27), washer (26), and three pins (25), and the pin keeper (24).

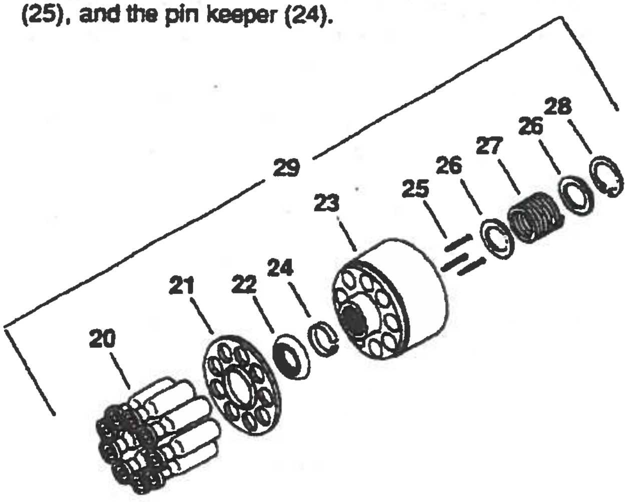


Figure 1

12 Remove retaining ring (1) from housing. Press shaft (8) from housing (9) and remove shaft seal (2), and washer (3).

13 Remove retaining ring (4) from shaft and remove thrust washers (5) and thrust bearing (6).

14 To remove the camplate (19) from the housing, remove the two retaining rings (14) from the sides of he housing. Remove the two covers (13 and 13A) and o-ring (12). Now remove the inner race (11) and needle bearings (10). The camplate can be slid over to one side and removed. The two camplate pivot bearings are loose fit into the housing; Do not be concerned if they are not tight.

15 Replace the shaft seal, gasket, backup washers and all o-rings with new items upon reassembly.

Inspection

1 Inspect the charge pump relief valve seat inside the charge pump adapter. Check to insure that the seat is smooth and free of burrs or other defects.

2 Inspect the charge pump relief valve spring (59).

3 Inspect the gerotor pocket inside the charge pump adapter housing (52). It should not be scored excessively.

4 Inspect the needle bearing inside the charge pump adapter housing, making sure that needles remain in the bearing cage.

5 Inspect the check valve assembly (53), make sure the ball seat is in good condition and the ball is free to move.

6 Inspect the flat surface of the backplate (33), the finish on the gerotor side should show no galling. The finish on the piston block side should be smooth and free of grooves. Replace the backplate if it shows any of the wear characteristics outlined above. Insure that the cam stop is tight in the specific backplate (33)design.

7 Inspect the piston block (23). Insure the surface that contacts the backplate is smooth and free of grooves.

8 The pistons (20) should move freely in the piston block bore. If they are sticky in the bore, examine the bore for scoring or contamination.

9 Examine the O.D. of the pistons for finish condition. They should not show wear or deep scratches. Inspect the shoes for a snug fit on the ball end of the pistons and a flat smooth surface that comes in contact with the camplate. DO NOT LAP PISTON SHOES.

10 Examine the spider (21) for wear in the pivot area.

11 Examine the pivot (22).to insure smoothness and no signs of wear.

12 The finish on polished shoe surface of the camplate (19) should show no signs of scoring.

13 Inspect the shaft (8) for fretting in the bearing and spline areas.

14 Inspect thrust bearing (6) and washers (5) for wear.

15 Inspect the needle bearings in the housing assembly, making sure needles remain in bearing cage.

Reassembly

1 Clean all parts in suitable solvent. lubricate all critical moving parts before reassembly.

2 Place the camplate (19) into the housing with the long trunnion down and to the appropriate side of linkage on the machine.

3 After installing the camplate, install new o-ring (18) on camplate trunnion. Insert the needle bearings (10) and the bearing inner race (11) over the shaft and slide into the housing. The numbered end of the race and bearing should face outward and the chamfered I.D. of the race inward. Install new o-ring (12) around O.D. of trunnion bearings. Install trunnion cover (13A) and sleeve cover (13) and secure with retaining ring (14).

4 Install retaining ring (4) on shaft (8). Install thrust washer (5), thrust bearing (6), and second thrust washer (5). Secure with second retaining ring (4).

5 Install shaft in housing. Install washer (3), new shaft seal (2), and retain with retaining ring (1).

6 If piston block assembly was disassembled complete the following: Compress the pin keeper (24) and install in the spline of piston block. Install the three pins (25) with head end to the inside of the block and install in the special grooves of the piston block spline.

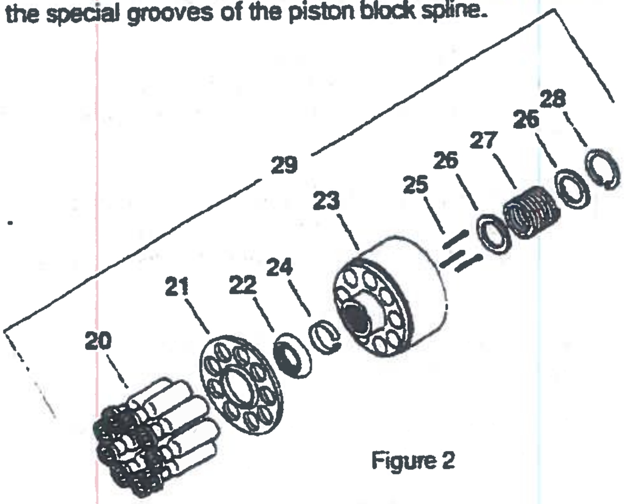


Figure 2

7 Install the washer (26), spring (27), and second washer (26) in the piston block. Use the two 3/8 I.D. washers, nut, and the 3/8 x 3-1/4 cap screw to compress the spring and retain with retaining ring (28). Remove the nut, cap screw and the two washers.

8 Install the pivot (22), spider (21), and the piston assemblies (20) on the piston block assembly (23). Install rotating assembly (29) in to housing assembly over shaft. The piston shoes must make contact with the camplate. Be sure all parts are in their proper position before proceeding.

9 Clamp pump assembly in a protected jaw vise with the open end of the housing up.

10 Install new gasket (31) over roll pins in housing.

11 Place backplate (33) over shaft and on housing with gasket in place.

12 Place ball (56) into check valve housing and secure with pin (57). Install new o-ring (55) and back-up washer (54) on check valve assembly (53).O-ring is nearest pin in check valve. Check valve is installed with the pin end into backplate.

13 Install outer gerotor ring (49) into adapter assembly (52). Lubricate ring to hold in place.

14 Install key (48) and inner gerotor (47) onto shaft (8) into backplate (33). Lubricate inner gerotor.

15 Install new o-ring (51or 51A) in groove, hold in place with clean clear grease. Place adapter plate assembly (52) on pump backplate. Install four cap screws (34 & 34A) and torque 27 to 31 lbs. ft.[37 to 42 N·m] (If bracket (63) is used, cap screws (34B) are used.)

16 Install new o-rings (42 & 44). Insert spreader (43) into separator plug (41) and retain with retaining ring (40).

17 Install tow valve assembly (38) or plug (39) in backplate (33). Torque 27 to 30 lbs. ft. [37 to 40 N·m].

18 Install relief valve assembly (38) and spring (37) into backplate. Place new o-ring (36) on plug (35) and retain spring and relief valve.Torque plug (35) 95-105 lbs ft. [129 to 142 N·m].

19 Remove pump from vise and install poppet (58), spring (59), and spring retainer (60) Torque spring retainer (60) 5 to 7 lbs ft. [7 to 10 N·m].

Start-up Procedure

When initially starting a new or a rebuilt propulsion system, it is extremely important that the start-up procedure be followed. It prevents the chance of damaging the unit which might occur if the system was not properly purged with oil before start-up.

1 After the propulsion components have been properly installed, fill the pump housing at least half full with filtered system oil. Connect all hydraulic lines and check to be sure they are tight.

2 Install and adjust all control linkage.

3 Fill the reservoir with an approved oil that has been filtered through a 10 micron filter.

4 Gasoline or L.P. engines: remove the coil wire and turn the engine over for 15 seconds. Diesel engines: shut off the fuel flow to the injector and turn the engine over for 15 seconds.

5 Replace the coil wire or return the fuel flow to the injectors. Place the propulsion unit in the neutral position, start the engine and run it at a low idle. The charge pump should immediately pick up oil and fill the system. If there is no indication of fill in 30 seconds, stop engine and determine the cause.

6 After the system starts to show signs of fill, slowly move pump camplate to a slight cam angle. Continue to operate system slowly with no load on motors until system responds fully.

7 Check fluid level in the reservoir and refill if necessary to the proper level with an approved filtered oil.

8 Check all line connections for leaks and tighten if necessary.

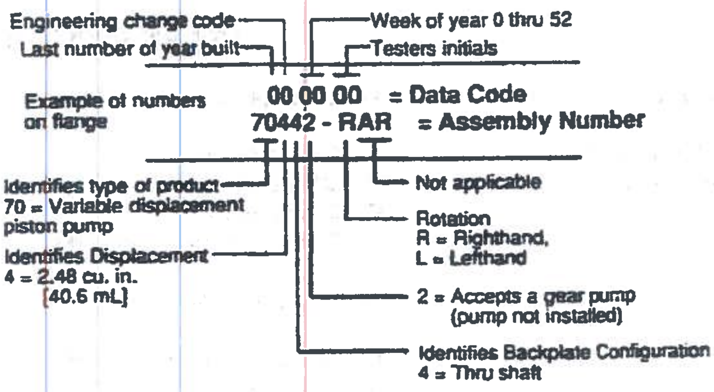
9 The machine is now ready to be put into operation.

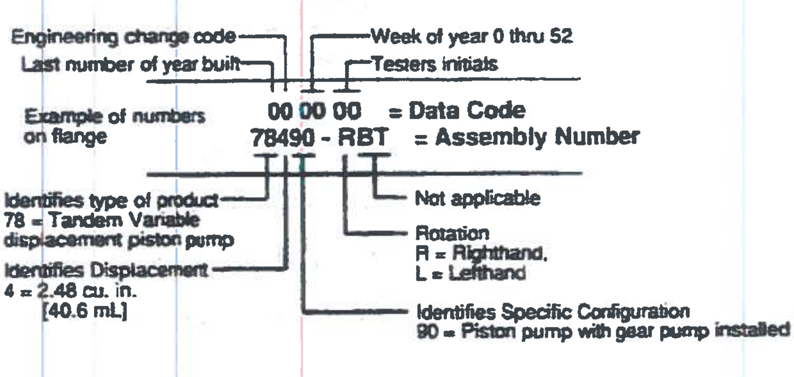
10 Short hour filter changes are recommended for the first two changes after placing the machine back into operation. The first filter would be changed in 3-5 hours and the second at approximately 50 hours. Routine scheduled filter changes are recommended for maximum life of the hydraulic system.

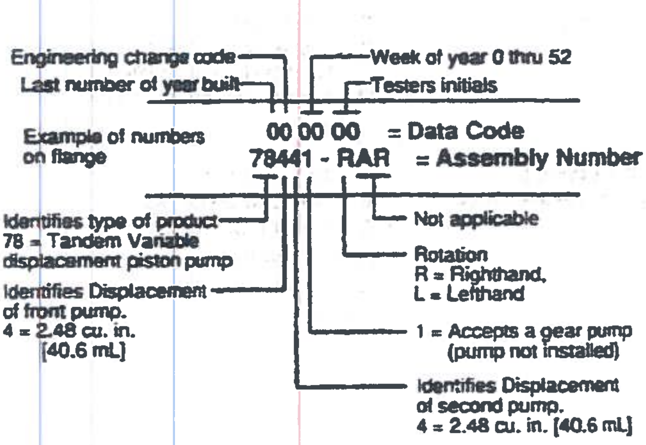
Trouble Shooting

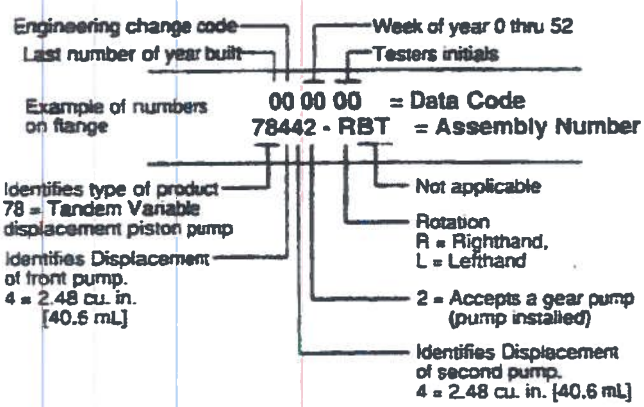
Problem	Possible Causes	Correction
1 System will not operate in either direction.	A Oil supply low.	A Check oil level, fill.
	B Oil filter clogged.	B Replace filter element.
	C Oil too heavy.	C Use proper viscosity oil.
	D Control linkage misadjusted.	D Check to see if control linkage is binding or unfastened.
	E Low charge pressure.	E See below: F, G, H, & I. Pressure should be 60-100 P.S.I.
	F Charge pump key sheared.	F Inspect charge pump for damage.
	G Charge pump relief valve damaged.	G Remove relief valve parts, examine parts and seat. Replace necessary parts.
	H Charge pump gears worn or scored.	H Remove parts and examine. Replace defective parts. If severe scoring is indicated, remove complete pump disassemble, clean, and inspect for damage.
	I Internal charge pump damage.	I Disassemble pump, inspect for damage.
	J Drive coupling broken.	J Inspect coupling for sheared spline, key or broken chain.
	L Relief valve stuck open.	L Remove relief valve. clean or replace.
	M Damaged check valve.	M Disassemble and check if check valve is faulty or damaged.
2 System Noisy	A Air in system.	A Low oil level in reservoir.
	B Loose suction line.	B Tighten fittings.
	C Clogged suction filter.	C Replace filter element.
	D Internal pump or motor damage.	D Disassemble, inspect and repair.
3 Sluggish response to acceleration or deceleration.	A Air in system.	A See step 1-A, 1-B, 1-C, 2-B.
	B Low charge pressure.	B See step 1-F 1-6, 1-I.
	C Internal pump or motor wear or damage.	C Disassemble, inspect and repair.
	D Relief valve dirty or damaged.	D Remove, clean or replace.

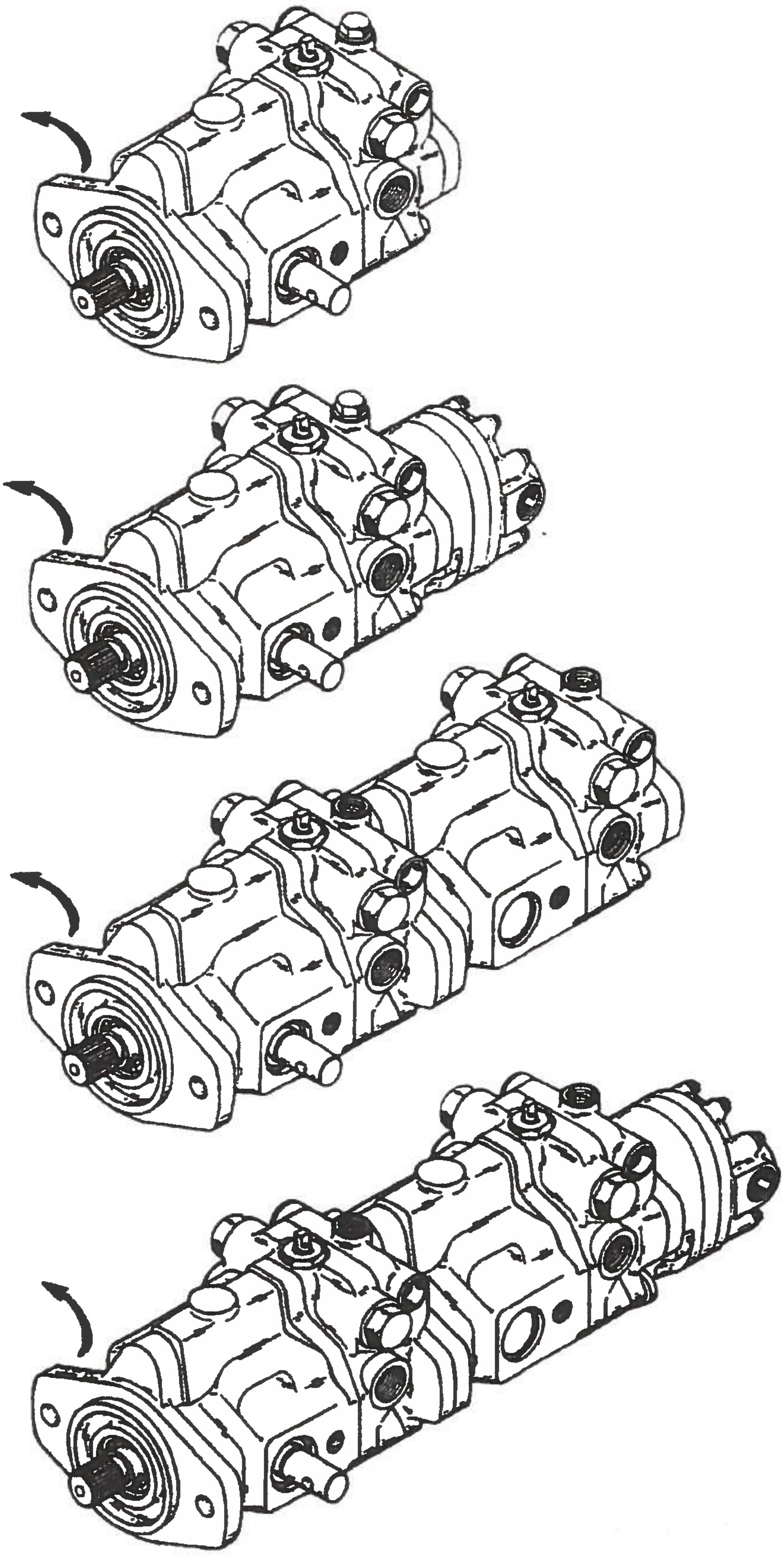
Identification Numbers


Engineering change code
Last number of year built
Week of year 0 thru 52
Testers initials
Example of numbers on flange
00 00 00 = Data Code
70442 - RAR = Assembly Number
Identifies type of product 70 = Variable displacement piston pump
Identifies Displacement 4 = 2.48 cu. in. [40.6 mL]
Not applicable
Rotation R = Righthand, L = Lefthand
2 = Accepts a gear pump (pump not installed)
Identifies Backplate Configuration 4 = Thru shaft


Engineering change code
Last number of year built
Week of year 0 thru 52
Testers initials
Example of numbers on flange
00 00 00 = Data Code
78490 - RBT = Assembly Number
Identifies type of product 78 = Tandem Variable displacement piston pump
Identifies Displacement 4 = 2.48 cu. in. [40.6 mL]
Not applicable
Rotation R = Righthand, L = Lefthand
Identifies Specific Configuration 90 = Piston pump with gear pump installed


Engineering change code
Last number of year built
Week of year 0 thru 52
Testers initials
Example of numbers on flange
00 00 00 = Data Code
78441 - RAR = Assembly Number
Identifies type of product 78 = Tandem Variable displacement piston pump
Identifies Displacement of front pump. 4 = 2.48 cu. in. [40.6 mL]
Not applicable
Rotation R = Righthand, L = Lefthand
1 = Accepts a gear pump (pump not installed)
Identifies Displacement of second pump. 4 = 2.48 cu. in. [40.6 mL]


Engineering change code
Last number of year built
Week of year 0 thru 52
Testers initials
Example of numbers on flange
00 00 00 = Data Code
78442 - RBT = Assembly Number
Identifies type of product 78 = Tandem Variable displacement piston pump
Identifies Displacement of front pump. 4 = 2.48 cu. in. [40.6 mL]
Not applicable
Rotation R = Righthand, L = Lefthand
2 = Accepts a gear pump (pump installed)
Identifies Displacement of second pump. 4 = 2.48 cu. in. [40.6 mL]



In ordering spare parts include the following information:

1 Product Number
2 Date Code
3 Part Name
4 Part Number
5 Quantity of Parts

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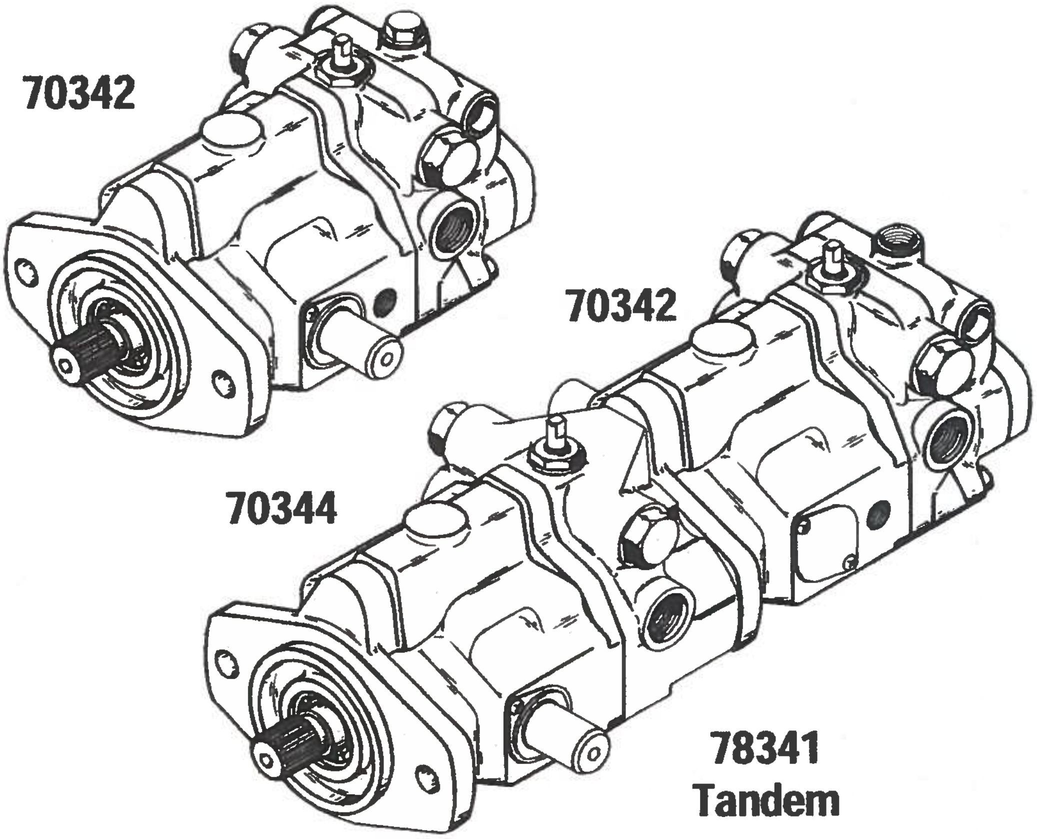
Eaton®

Medium Duty Piston Pump

No. 7-620
January, 1996

Repair Information



Model 70342 and 70344, 40.6 cm^3/r [2.48 in^3/r] Displacement
Manually Variable Displacement Piston Pump

Introduction

Table of Contents

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Identification 3
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Introduction

This manual provides service information for the Eaton Models 70342 and 70344 Manually Variable Displacement Piston Pumps. Step by step instructions for the complete disassembly, inspection, and reassembly of the pump are given. The following recommendations should be followed to insure successful repairs.

- Remove the pump from the application.
- Cleanliness is extremely important.
- Clean the port areas thoroughly before disconnecting the hydraulic lines.
- Plug the pump ports and cover the open hydraulic lines immediately after they're disconnected.
- Drain the oil and clean the exterior of the pump before making repairs.
- Wash all metal parts in clean solvent.
- Use compressed air to dry the parts. Do not wipe them dry with paper towels or cloth.
- The compressed air should be filtered and moisture free.
- Always use new seals when reassembling hydraulic pumps.
- For replacement parts and ordering information refer to Parts Information booklet #6-626.
- Lubricate the new rubber seals with a petroleum jelly (Vaseline) before installation.
- Torque all bolts over gasketed joints, then repeat the torquing sequence to make-up for gasket compression.
- Verifying the accuracy of pump repairs on an authorized test stand is essential.

Identification and Tools Required

Identification Numbers

Manually Variable Displacement Piston Pump
Stamped on each unit's mounting flange.

A - Product Number Discription
70342 = Single Piston Pump with Gerotor
70344 = Single Piston Pump without Gerotor
78341 = Tandem Piston Pump with Gerotor
78343 = Tandem Piston Pump without Gerotor

B - Rotation
R = Righthand,
L = Lefthand
C - Sequential Letters

Single Pump - Product Number

70342 - R A A
A = 70342, B = R, C = A

Tandem Pumps - Product Number

78341 - R A B
A = 78341, B = R, C = B

Serial Number Code:

B 94 01 31 JB

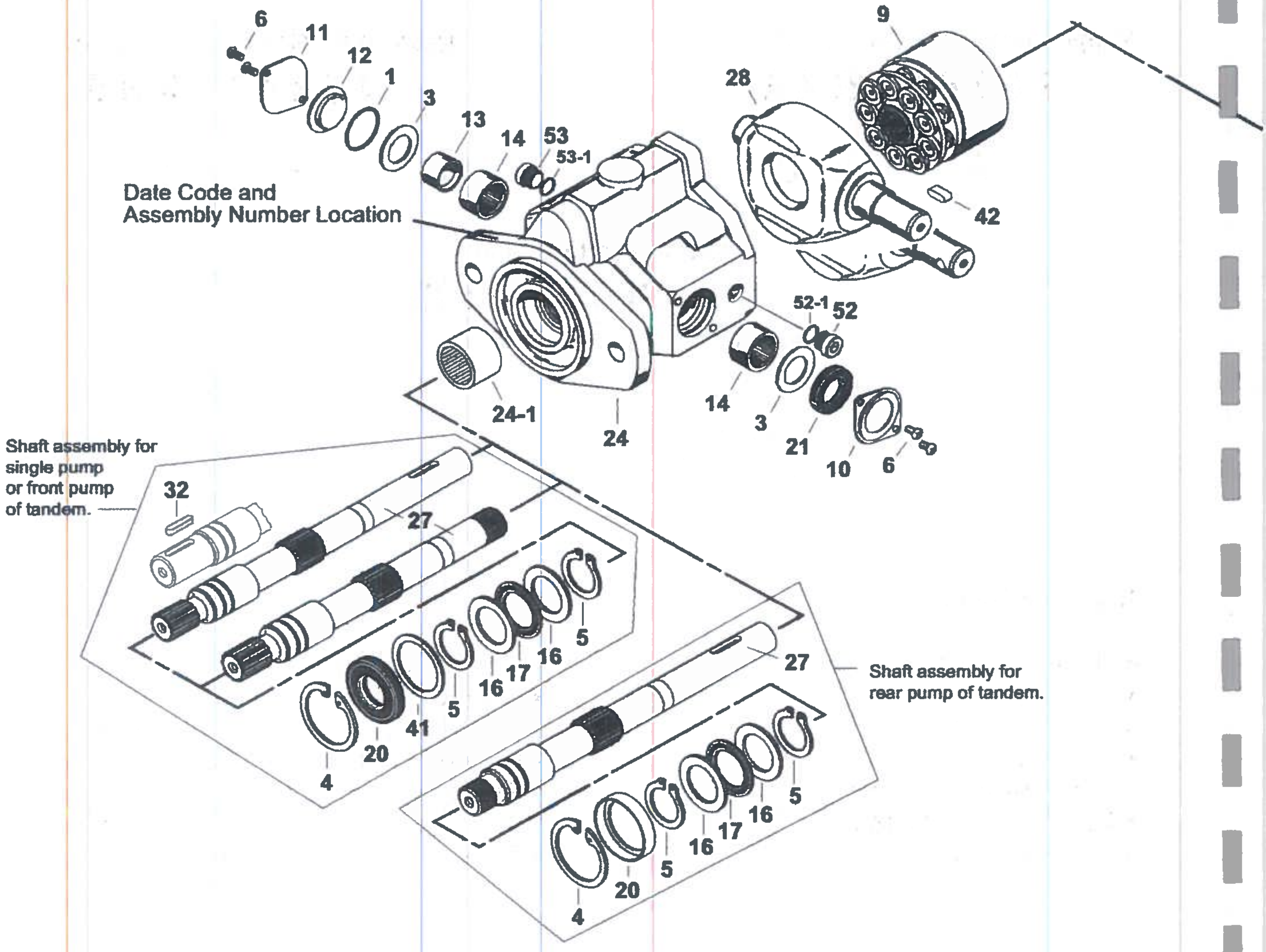
B - Revision level of parts list.
94 - Last two digits of year built. ('94 for 1994, etc.)
01 - Month (two digits)
31 - Day of Month (two digits)
JB - Tester's Initials

Required Tools

- 9/16 Inch Socket
- 1 Inch Socket
- 1-1/8 Inch Socket
- Rachet Wrench
- Torque Wrench (100 lb./ft.)
- 7/16 Inch Hex Key (Allen)
- 9/16 End Wrench
- T-25 Torx Screwdriver
- Soft Face Hammer
- Internal Retaining Pliers (Straight .090 Tip)
- External Retaining Pliers (Straight .070 Tip)
- Regular or Locking Pliers
- Seal Driver or Similar Tool
- Petroleum Jelly (Such as Vaseline)

Parts Drawing - Figure 1-1

Pump drawn below is typical of a righthand rotation pump.



Date Code and Assembly Number Location

Shaft assembly for single pump or front pump of tandem.

Shaft assembly for rear pump of tandem.

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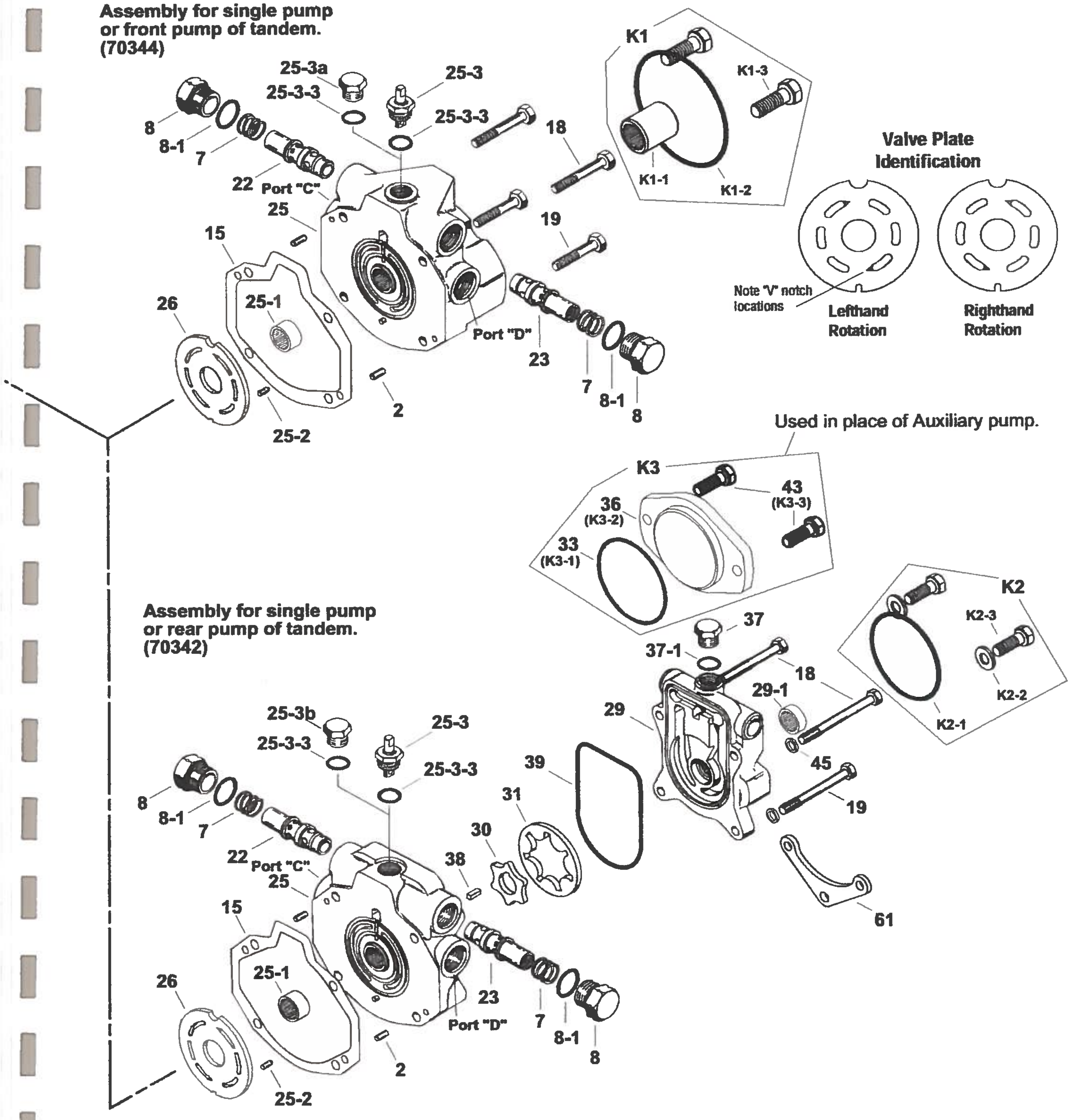
Parts Drawing - Figure 1-1



Parts List

	Item	Qty.	Description
+	1	1	O-ring, 2.38 mm Dia. x 36.5 mm I.D. [.0937 in. Dia. x 1.4375 in. I.D.]
	2	2	Dowel Pin
	3	2	Washer
+	4	1	Retaining Ring
+	5	2	Retaining Ring
	6	4	Screw
	7	2	Spring
	8	2	Plug Assembly
+	8-1	2	O-ring, 2.38 mm Dia. x 22.23 mm I.D. [.0937 in. Dia. x .875 in. I.D.]
	9	1	Rotating Kit Assembly (parts list on page #6)
	10	1	Seal Cover
	11	1	Trunnion Cover
	12	1	O-ring Cover
	13	1	Inner Race
	14	2	Needle Bearing
+	15	1	Housing Gasket
	16	2	Thrust Race
	17	1	Needle Thrust Bearing
	18	2	Cap Screws (Locations on page #6)
			3/8-16, 57.2 mm [2.25 in.] Long
			3/8-16,101.6 mm [4.0 in.] Long
	19	2	Cap Screws (Locations on page #6)
			3/8-16, 38.1 mm [1.5 in.] Long
			3/8-16, 50.8 mm [2.0 in.] Long
			3/8-16, 88.9 mm [3.5 in.] Long
+	20	1	Shaft Seal, Drive
	20	1	Viton Shaft Seal, Drive
	20	1	Spacer (Used in rear pump of tandem in place of drive shaft seal.)
+	21	1	Shaft Seal, Trunnion
	21	1	Viton Shaft Seal, Trunnion
	22	1	Relief Valve for Port "C" (Identification drawing on page #7)
	23	1	Relief Valve for Port "D" (Identification drawing on page #7)
	24	1	Housing Assembly (Identification drawing on page #7)
	24-1	1	Bearing (press fit)
	25	1	Backplate Assembly (Identification drawing and parts list on page #8 & #9)
	26	1	Valve Plate (Identification drawing on page #3)
			Righthand (CW) Rotation
			Lefthand (CCW) Rotation
	27	1	Drive Shaft (Identification drawing on page #12)
	28	1	Camplate
			Key groove in trunnion
			Cross hole in trunnion
	29	1	Charge Pump Adaptor (Identification drawing and parts list on page #10 & #11)
	30	1	Inner Gerotor
			6.9 cm^3/r [.42 in^3/r] displacement, 6.35 mm [.25 in] width
			13.8 cm^3/r [.84 in^3/r] displacement, 12.7 mm [.5 in] width
	31	1	Outer Gerotor
			6.9 cm^3/r [.42 in^3/r] displacement, 6.35 mm [.25 in] width
			13.8 cm^3/r [.84 in^3/r] displacement, 12.7 mm [.5 in] width
	32	1	Key, Drive Shaft
			Used with 25.4 mm[1.00 in] dia. drive shaft.
			Used with 22.2 mm [.875 in] dia. drive shaft.
	33	1	O-ring (In K2 & K3 kit)
	35	1	Mounting Bracket
	36	1	Cover Plate (In K3 kit)

Parts List (Cont.)

Item	Qty.	Description
37	1	Plug Assembly
+ 37-1	1	O-ring, 2.21 mm Dia. x 16.36 mm ID. [.087 in. Dia. x .644 in. ID.]
38	1	Key, Gerotor Pump Adapter
+n 39	1	Molded O-ring
40	2	Washer
41	1	Washer
42	1	Key, Camplate Trunnion
43	2	Cap Screws, Cover Plate (In K3 kit)
52	1	Plug Assembly
52-1	1	O-ring, 1.98 mm Dia. x 11.89 mm ID. [.078 in. Dia. x .468 in. ID.]
53	1	Plug Assembly
53-1	1	O-ring, 1.98 mm Dia. x 11.89 mm ID. [.078 in. Dia. x .468 in. ID.]

Mounting Kits

K1	1	Tandem Piston Pump Mounting Kit
K1-1	1	41T Coupler, 33.02 mm [1.3 in.] long
K1-2	1	O-ring, 1.59 mm Dia. x 101.6 mm ID. [.0625 in. Dia. x 4 in. ID.]
K1-3	2	Cap Screws
K2	1	Gear Pump Mounting Kit
K2-1	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K2-2	1	Washer
K2-3	2	Cap Screws
K3	1	Cover Plate Kit
K3-1	1	O-ring, 1.59 mm Dia. x 82.55 mm ID. [.0625 in. Dia. x 3.25 in. ID.]
K3-2	1	Cover Plate
K3-3	2	Cap Screws

Seal Repair Kits

•	1	Seal Repair Kit for 70342 piston pump.
•	1	Seal Repair Kit for 70342 piston pump (Shaft seal not included).
•	1	Seal Repair Kit for 70342 piston pump (Includes dump valve seals).
•	1	Seal Repair Kit for 70344 piston pump (Shaft seal not included).
•	1	Seal Repair Kit for 70344 piston pump.

Legend

+ Common parts to seal repair kits listed.
+n Parts included in the 70342-900, 70342-901, and 70342-902 along with common parts.

Disassembly

The following instructions apply to a variable displacement piston pump with or without a gerotor charge pump. A tandem pump assembly should be separated into individual pumps before disassembly.

1 Position the pump into a protected jaw vise, clamping onto the outer portion of the flange, with the input drive shaft down. Remove the four cap screws retaining charge pump adapter or backplate.

If there is no gerotor charge pump, skip to step 6.

2 Lift the charge pump adapter assembly straight up off backplate, shaft, and gerotor. Gerotor may stay in adapter or on backplate.

3 Remove o-ring from charge pump adapter.

4 Remove outer gerotor ring from either the charge pump adapter or the inner gerotor ring.

Refer to Appendix A for disassembly and inspection of charge pump adapter assembly.

5 Remove the inner gerotor ring and coupler assembly from shaft.

6 Lift backplate straight up off of shaft and housing. Remove valve plate from backplate or from rotating kit assembly, still in housing.

7 From backplate remove dump valve assembly or plug assembly, and relief valve assemblies. Note: Mark the relief valve in relationship to the cavity it was removed, for reassembly purposes.

Backplate Inspection:

- Check the bearing (press fit) in backplate. If needles remain in cage, move freely, and setting is at the dimension shown in figure 1-3, removal not required.
- Check roll pin in backplate. If tight and set to the dimension shown in figure 1-3, removal not required.

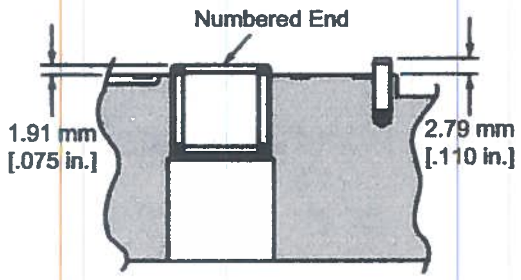


Figure 1-3

8 Remove housing gasket from housing or backplate.

9 To remove rotating kit assembly from housing, first remove pump from vise holding the rotating kit assembly in position. Lower pump so that the shaft end (flange end) is up. Set the rear of housing onto table with housing flat and rotating kit assembly at rest on table. Hole in table for protruding shaft is required. Remove by lifting the housing and shaft from rotating kit assembly.

Refer to Appendix B for rotating kit disassembly and inspection.

10 Remove retaining ring from the front of housing. Press the shaft, shaft seal or spacer, and washer from housing. Remove retaining ring, thrust washer, thrust bearing, second thrust washer, and second retaining ring from shaft.

11 To remove camplate from housing, remove the two screws from both sides of housing (four total) retaining seal cover and trunnion cover. **Note the location of the control shaft before it is removed.** Remove seal cover, shaft seal, washer, and bearing from housing. Remove trunnion cover, o-ring cover, o-ring, washer, inner race, and bearing from housing. Slide the camplate over to one side and remove thru the back side of housing.

Camplate Inspection:

- The finish on the piston shoe surfaces of the camplate should show no signs of scoring.

Housing Inspection:

- Check the bearing (press fit) in front of housing. If needles remain in cage, move freely, and setting at the dimension shown in figure 1-4, removal not required.

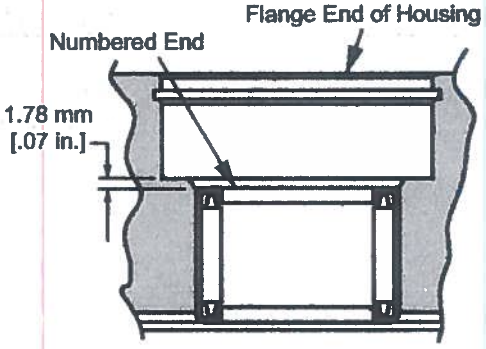


Figure 1-4

12 Discard the shaft seal, gaskets, and o-rings from all assemblies. Replace with new seals upon reassembly.

Reassembly

1 All parts should be cleaned and critical moving parts lubricated before reassembly.

2 If necessary, press new bearing in housing to dimension shown in figure 1-4 with the numbered end of bearing outward.

3 Starting with the camplate, insert camplate into the housing with the long trunnion side down and align it as it had been marked before removal. This would have been marked in step 11 of disassembly.

4 On the short trunnion side of camplate install bearing (bearing with numbered side to the outside of pump), bearing race (race with chamfer toward inside of pump), washer, o-ring, o-ring cover, trunnion cover, and retain with two screws. Torque screws 4.1 to 5.4 N·m [36 to 48 lbf·in].

5 On the long trunnion side of camplate install bearing (bearing with numbered side to the outside of pump), washer, trunnion shaft seal, seal cover, and retain with two screws. Torque screws 4.1 to 5.4 N·m [36 to 48 lbf·in].

6 To install shaft, place exterior retaining ring, thrust race, thrust bearing, second thrust race, and second retaining ring onto shaft. Position washer and shaft seal or spacer onto shaft.

7 Install shaft assembly into front of housing: For units with spacer, retain with interior retaining ring and go on to step 8. For units with shaft seal, seat seal into position with seal driver and retain with interior retaining ring.

Refer to Appendix B for reassembly of rotating kit assembly.

8 With flange end of housing up, position rotating kit assembly onto shaft and into housing. Align the spline within the piston block with shaft internal spline. Make sure piston block is engaged fully to put piston shoes in contact with camplate. Check all parts for proper position before proceeding.

9 Clamp pump assembly in a protected jaw vise with the open end of the housing up. Install gasket and two dowel pins onto housing.

10 If necessary, press new bearing and roll pin in backplate to dimension shown in figure 1-3. Bearing installed with the numbered end outward. Roll pin installed with split oriented away from bearing.

11 Install new o-ring on relief valves. Install relief valve in its original cavity in backplate that it was removed. Torque 128 to 142 N·m [95 to 105 lbf·ft.]

12 Install new o-ring on dump valve or plug. Install dump valve or plug into backplate. Torque dump valve or plug to 36.6 to 40.7 N·m [27 to 30 lbf·ft]

13 Apply a small amount of petroleum jelly to the steel side of valve plate to hold in place for installation. Aligning the index pin, place the valve plate in position onto the backplate, with steel side against backplate.

14 Install backplate assembly onto housing assembly. Making sure valve plate and gasket stay in place.

If there is no gerotor charge pump, skip to step 17.

15 Install inner gerotor and coupler assembly. The coupler has a "V" groove on one end and this end of coupler should enter backplate first. Lubricate inner gerotor.

Refer to Appendix A for reassembly of charge relief valve in adapter plate.

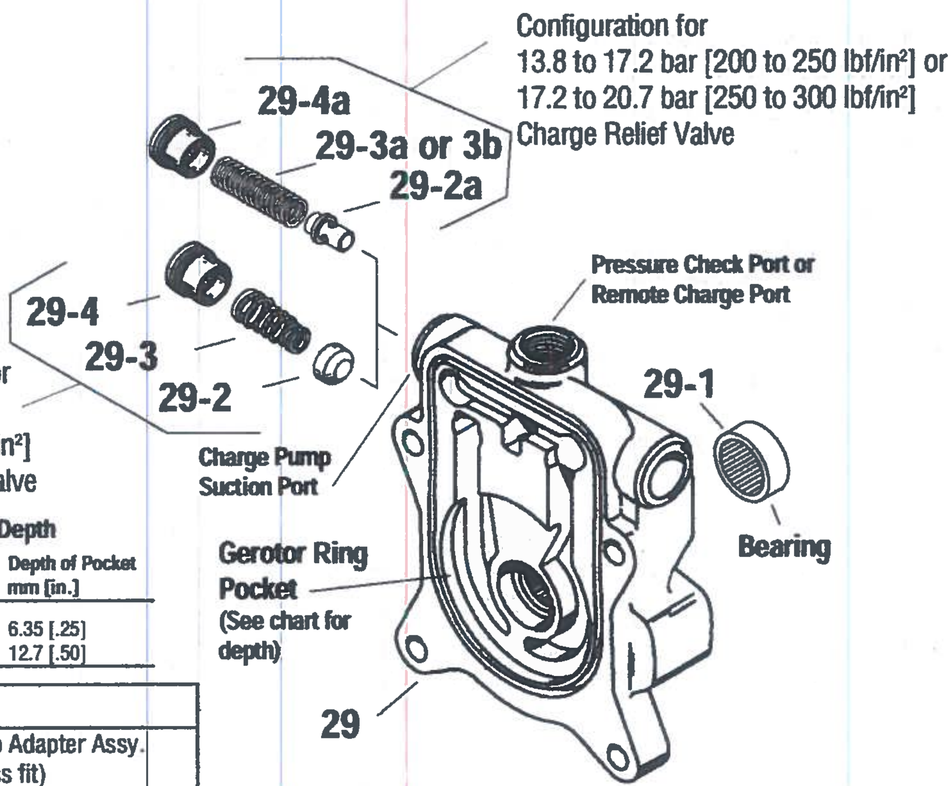
16 Install o-ring and outer gerotor ring onto adapter plate. Lubricate both o-ring and outer gerotor ring to hold in position during assembly of adapter plate. Install adapter plate onto backplate. Make sure o-ring and gerotor ring stay in place.

17 Retain backplate and adapter plate (when used) with four cap screws, Torque 23 to 27 N·m [17 to 20 lbf·ft].

18 Install new o-rings on all plugs. Install plugs into housing. Torque 9/16 in. - 18 plug 28 to 32 N·m [21 to 24 lbf·ft].

19 Refer to start-up procedures on page 17.

Appendix A - Charge Pump Adapter Assembly



Gerotor Pocket Depth

Displacement cm³/r [in³/r]	Depth of Pocket mm [in.]
6.9 [.42]	6.35 [.25]
13.8 [.84]	12.7 [.50]

Item	Qty.	Description
29	1	Charge Pump Adapter Assy.
29-1	1	Bearing (press fit)
29-2	1	Poppet, Cup
29-2a	1	Poppet, Pin
29-3	1	Spring, Tappered
29-3a	1	Spring, "Light Green" *
29-3b	1	Spring, "Pink" **
29-4	1	Spring Retainer
29-4a	1	Spring Retainer

*200 to 250 lbf/in^2

**250 to 300 lbf/in^2

Disassembly - Charge Pump Adapter Assembly

1 Remove spring retainer, spring, and poppet from adapter assembly.

Inspection:

- Inspect the charge pump relief valve seat inside the charge pump adapter. Check to insure that the seat is smooth and free of burrs or other defects.
- Inspect the charge pump relief valve spring.
- Inspect the bearing inside the charge pump adapter. The bearing needles must remain in the bearing cage and bearing at dimension shown in figure 1-2.
- Inspect the gerotor pocket inside the charge pump adapter assembly. It should not be scored excessively.

Reassembly - Charge Pump Adapter Assembly

1 If necessary, press the new bearing into the adapter assembly to the dimension shown in figure 1-2 with the numbered end of bearing outward and closest to mounting flange.

2 Install cup poppet or pin poppet, spring, and spring retainer into charge pump adapter. Torque retainer 6.8 to 9.5 N·m [5 to 7 lbf·ft.].

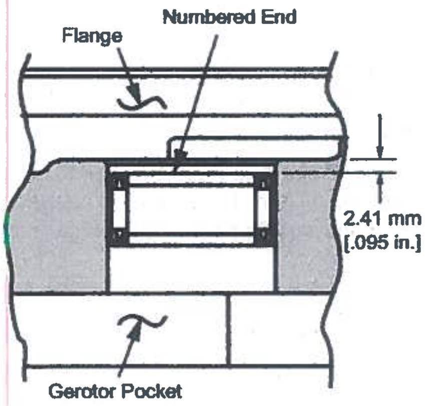
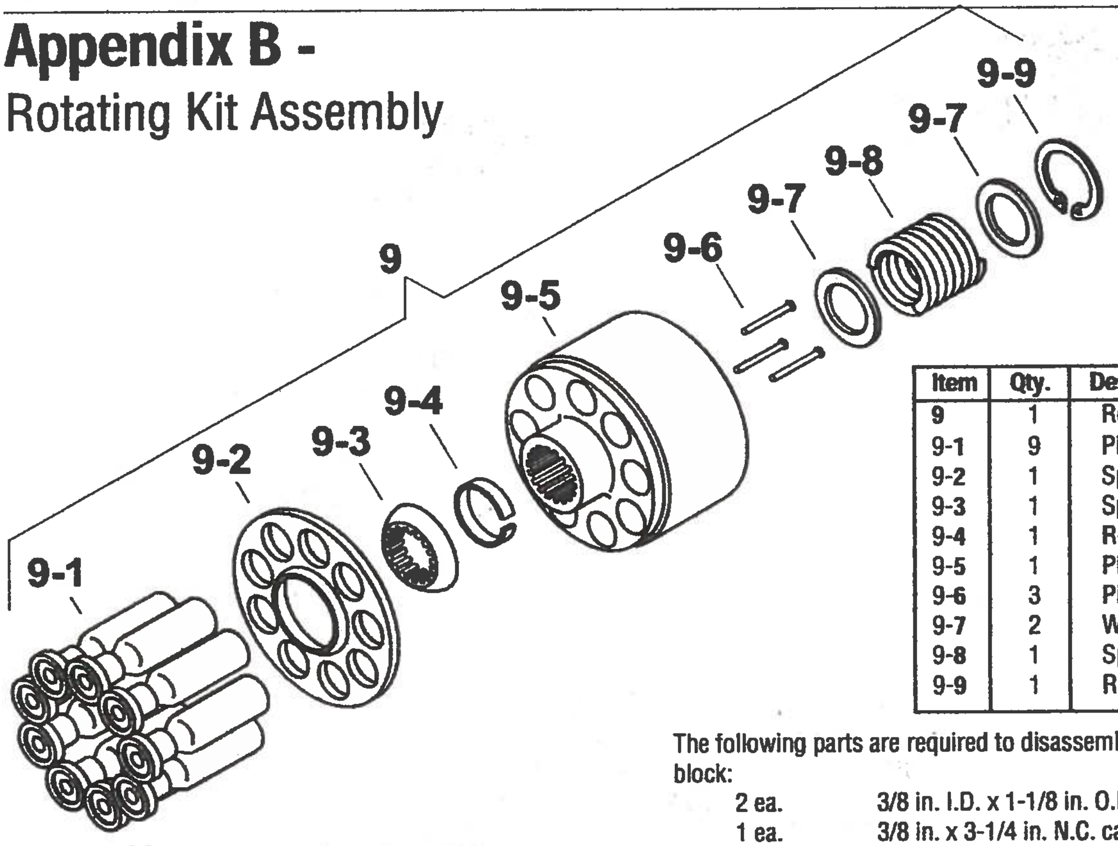


Figure 1-2

Appendix B -

Rotating Kit Assembly



Item	Qty.	Description
9	1	Rotating Kit Assy.
9-1	9	Piston Assembly
9-2	1	Spider
9-3	1	Spider Pivot
9-4	1	Retainer
9-5	1	Piston Block
9-6	3	Pins
9-7	2	Washer
9-8	1	Spring
9-9	1	Retaining Ring

Disassembly - Rotating Kit Assembly

Disassembly of rotating assembly is required for inspection only.

1 Remove the nine piston assemblies, spider, and spider pivot from piston block.

Inspection:

- Examine the O.D. of the pistons for finish condition. They should not show wear or deep scratches. Inspect the shoes for a snug fit on the ball end of the pistons and a flat smooth surface that comes in contact with the camplate. **Do not lap piston shoes.**
- Examine the spider for wear in the pivot area.
- Examine the pivot to insure smoothness and no signs of wear.
- Inspect the piston block surface that makes contact with valve plate. This surface should be smooth and free of deep scratches. **Do not lap piston block.**
- The pistons should move freely in the piston block bore. If not free moving, examine the bore for scoring or contamination.

2 To inspect pins and spring **Caution** should be taken in removing spring. The **spring is highly compressed** and the retaining ring should not be removed without compressing the spring safely.

The following parts are required to disassemble the piston block:

2 ea.	3/8 in. I.D. x 1-1/8 in. O.D. flat washers
1 ea.	3/8 in. x 3-1/4 in. N.C. cap screw, and
1 ea.	3/8 in. N.C. nut

To remove spring, place one of the flat washers over the 3/8 in. x 3-1/4 in. cap screw. Put cap screw through the center of the piston block and apply the second washer. Let washer rest on the three pins and retain with nut. Turning nut and compressing spring inside the block. Use a pair of retaining ring pliers and remove the internal retaining ring. Remove nut, bolt, and the two washers from block. Remove the washer, spring, second washer, three pins, and pin keeper at the same time.

Reassembly - Rotating Kit Assembly

1 To reassemble the rotating kit assembly complete the following: Compress the pin keeper and install it in the spline of the piston block. Install the three pins with head end to the inside of the block and position in the special grooves of the piston block spline.

2 Install the washer, spring, and second washer into the piston block. Use the two 3/8 in. I.D. washers, nut, and 3/8 in. x 1-1/4 in. cap screw to compress the spring and retain with retaining ring. Remove the nut, cap screw, and the two washers.

3 Install the pivot onto the three pins, the spider on the pivot, and the piston assemblies through the spider and into the piston block, resting on spider.

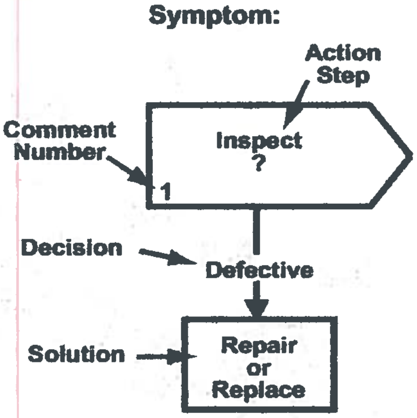
Fault - Logic Trouble Shooting

This fault - logic trouble shooting guide is a diagnostic aid in locating transmission problems.

Match the transmission symptoms with the problem statements and follow the action steps shown in the box diagrams. This will give expedient aid in correcting minor problems eliminating unnecessary machine down time.

Following the fault - logic diagrams are diagram action comments of the action steps shown in the diagrams. Where applicable, the comment number of the statement appears in the action block of the diagrams.

Explanatory Diagram



Recommended Gauge Locations

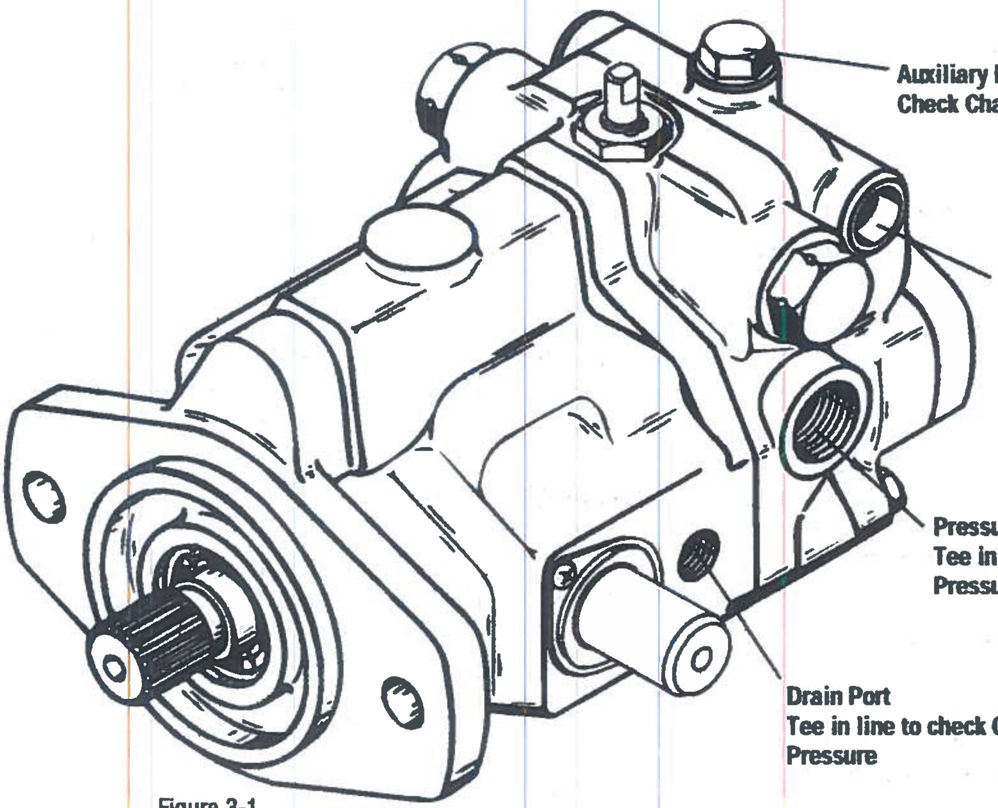

Auxiliary Port
Check Charge Pressure
Charge Pump Suction Port
Tee in line to check Inlet Vacuum
Pressure Ports
Tee in line to check System Pressure
Drain Port
Tee in line to check Case Pressure

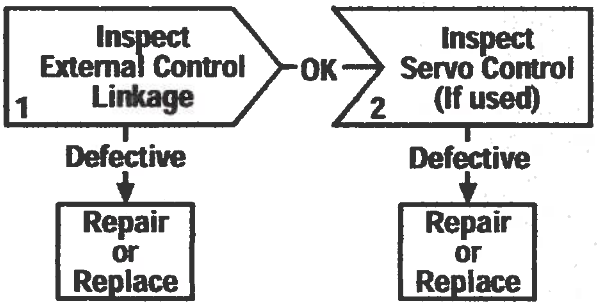
Figure 3-1

Gauges Recommended

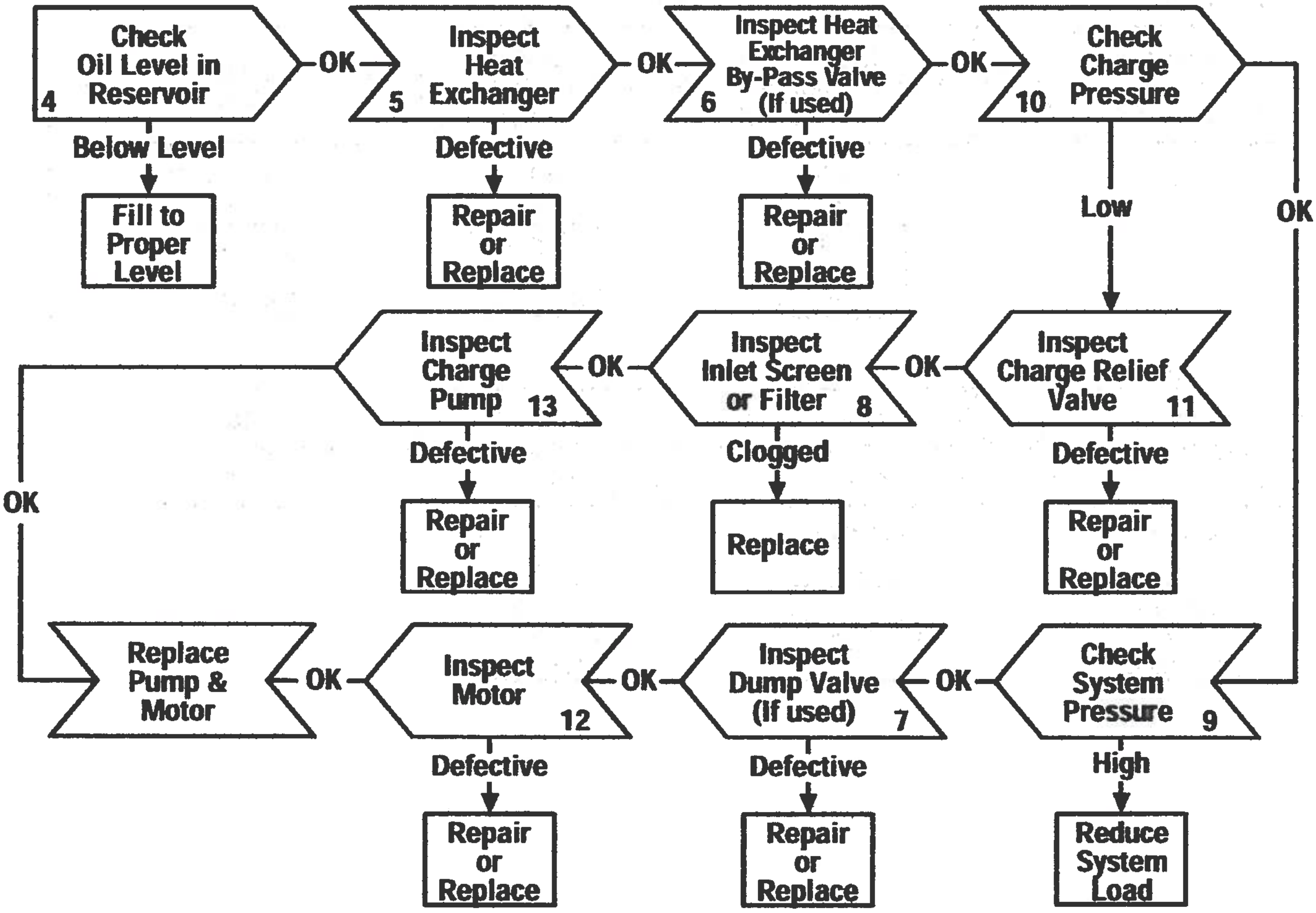
Inlet vacuum gauge: 2 bar to 1 bar [30 lbf/in^2 to 30 inHg]
System pressure gauge: 700 bar [10,000 lbf/in^2]
Charge pressure gauge: 0 to 50 bar [0 to 600 lbf/in^2]
Case pressure gauge: 0 to 25 bar [0 to 300 lbf/in^2]

Fault - Logic
Trouble Shooting

Symptom: Neutral Difficult or Impossible to Find

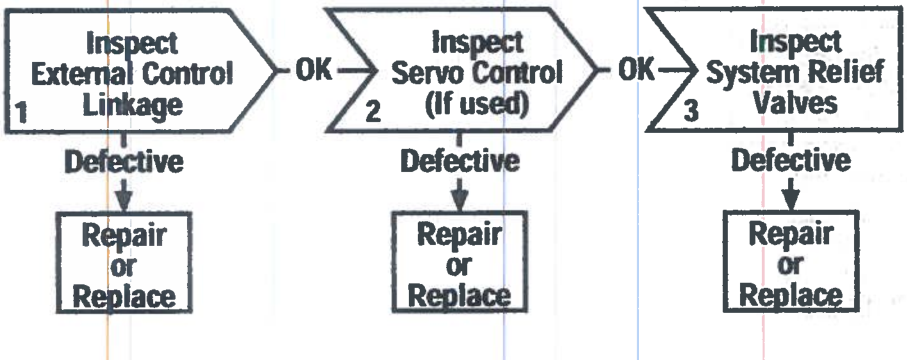

1
Inspect External Control Linkage
OK
2
Inspect Servo Control (If used)
Defective
Repair or Replace
Defective
Repair or Replace

Symptom: System Operating Hot

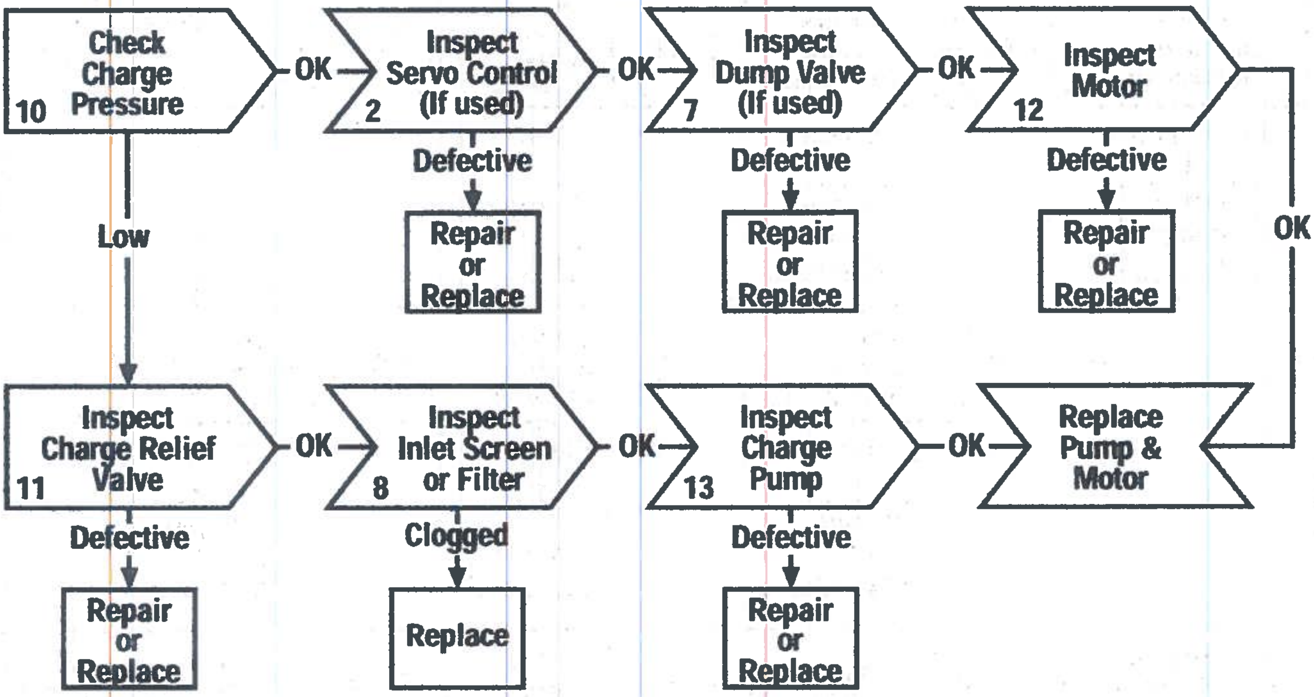


Fault - Logic Trouble Shooting

Symptom: Operates in One Direction Only

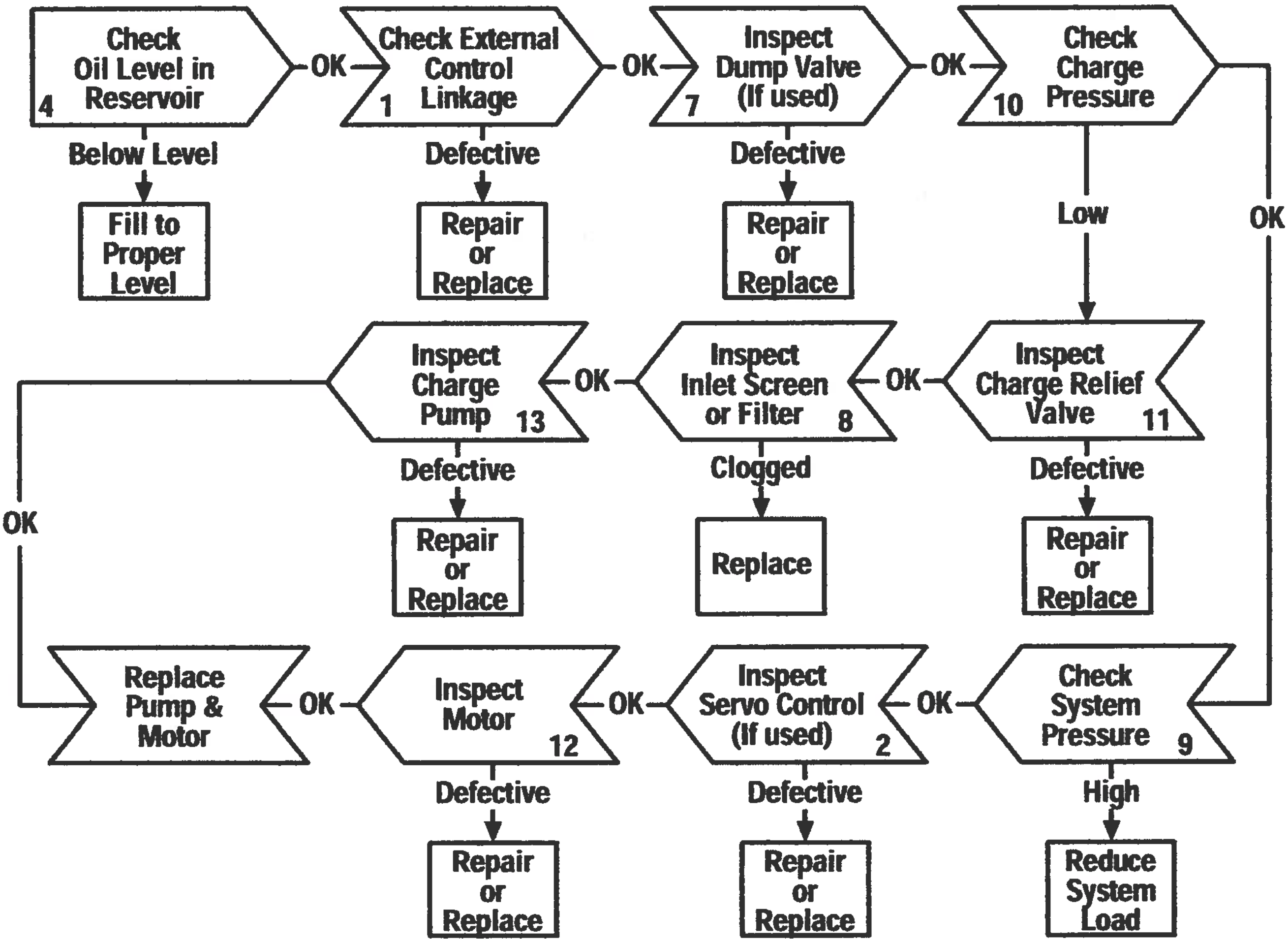

1 Inspect External Control Linkage
OK
2 Inspect Servo Control (If used)
OK
3 Inspect System Relief Valves
Defective
Repair or Replace
Defective
Repair or Replace
Defective
Repair or Replace

Symptom: System Response Sluggish



Fault - Logic Trouble Shooting

Symptom: System Will Not Operate In Either Direction



Fault - Logic Trouble Shooting

Diagram Action Step Comments

1 **Inspect External Control Linkage for:**
   a. misadjustment or disconnection
   b. binding, bending or breakage
   c. misadjusted, damaged or broken neutral return spring

2 **Inspect Servo Control Valve for: (if used)**
   a. proper inlet pressure
   b. misadjusted, damaged or broken neutral return spring
   c. galled or stuck control spool
   d. galled or stuck servo piston

3 **Inspect System Relief Valves* for:**
   a. improper pressure relief setting
   b. damaged or broken spring
   c. valve held off seat
   d. damaged valve seat

4 **Check Oil Level in Reservoir:**
   a. consult owner/operators manual for the proper type fluid and level

5 **Inspect Heat Exchanger for:**
   a. obstructed air flow (air cooled)
   b. obstructed water flow (water cooled)
   c. improper plumbing (inlet to outlet)
   d. obstructed fluid flow

6 **Inspect Heat Exchanger By-Pass Valve for: (if used)**
   a. improper pressure adjustment
   b. stuck or broken valve

7 **Inspect Dump Valve for: (if used)**
   a. held in a partial or full open position

8 **Inspect Inlet Screen or Filter for:**
   a. plugged or clogged screen or filter element
   b. obstructed inlet or outlet
   c. open inlet to charge pump

9 **Check System Pressure:**
   a. See figure 3-1 for location of pressure gauge installation.
   b. consult owner/operators manual for maximum system relief valve settings

10 **Check Charge Pressure:**
   a. See figure 3-1 for location of pressure gauge installation.
   b. consult owner/operators manual for maximum charge relief valve settings

11 **Inspect Charge Relief Valve for:**
   a. improper charge relief pressure setting *
   b. damaged or broken spring
   c. poppet valve held off seat

12 **Inspect Motor for:**
   a. disconnected coupling

13 **Inspect Charge Pump for:**
   a. broken or missing drive key
   b. damaged or missing o-ring
   c. excessive gerotor clearance
   d. galled or broken gerotor set

*** System/Charge Relief Valve Pressure Settings for Eaton's Variable Displacement Controlled Piston Pumps**

Inlet Vacuum	6 inHg max.
Case Pressure	25 lbf/in² maximum
Charge Pressure	100 to 150 lbf/in² Standard 200 to 250 lbf/in2 Optional 250 to 300 lbf/in2 Optional
System Pressure	5000 lbf/in² maximum 3000 lbf/in² continuous

The high pressure relief valves are all factory preset and cannot be readjusted.

The pressure setting and assembly number is stamped on each high pressure relief valve cartridge.

Valve Identification Example:

32060-IA 5000

Relief Valve Setting

Relief Valve Assembly Number

Start-up Procedure

When initially starting a new or rebuilt transmission system, it is extremely important that the start-up procedure be followed. It prevents the chance of damaging the unit which might occur if the system was not properly purged of air before start-up.

1. After the transmission components have been properly installed, fill the pump housing at least half full with filtered system oil. Connect all hydraulic lines and check to be sure they are tight.
2. Install and adjust all control linkage.
3. Fill the reservoir with an approved oil that has been filtered through a 10 micron filter. Refer to Eaton Hydraulics Technical Data sheet number 3-401 titled Hydraulic Fluid Recommendations.
4. Gasoline or L.P. engines: remove the coil wire and turn the engine over for 15 seconds. Diesel engines: shut off the fuel flow to the injectors and turn the engine over for 15 seconds.
5. Replace the coil wire or return the fuel flow to the injectors. Place the transmission unit in the neutral position, start the engine and run it at a low idle. The charge pump should immediately pick up oil and fill the system. If there is no indication of fill in 30 seconds, stop engine and determine the cause.
6. After the system starts to show signs of fill, slowly move pump camplate to a slight cam angle. Continue to operate system slowly with no load on motors until system responds fully.
7. Check fluid level in the reservoir and refill if necessary to the proper level with an approved filtered oil.
8. Check all line connections for leaks and tighten if necessary.
9. The machine is now ready to be put into operation.
10. Frequent filter changes are recommended for the first two changes after placing the machine back into operation. Change the first filter in 3-5 hours and the second in approximately 50 hours. Routinely scheduled filter changes are recommended for maximum life of the hydraulic system.

Notes

Notes

Order parts from number 6-626 Parts Information booklet.
Each order must include the following information.

1. Product and/or Part Number
2. Serial Code Number
3. Part Name
4. Quantity

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Eaton GmbH
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Fax 02102-406-800

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ISO-9001 CERTIFICATED FIRM

Quality System Certified
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EATON

EATON | Vickers

M Series Vickers Piston Pumps
Pressure & Flow Compensator Kit

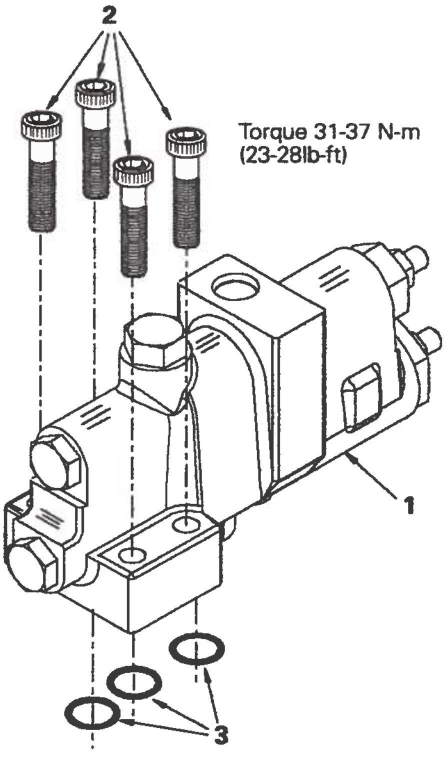
Installation Information

PVM057 / 063
PVM074 / 081
PVM098 / 106
PVM131 / 141

For more detailed information contact EATON Hydraulics at one of the addresses listed below.

Please reference the following documents:

- For Specifications and Performance Data see Catalogs
  - V-PP-MC-0003-E Rev. August 2002
  - V-PP-MC-0004-E Rev. August 2002
- For parts Information for the PVM Piston Pump refer to Service Data below.
- When servicing PVM Piston Pump Compensators refer to this Service Data document:
  - V-PP-TP-0001-E Rev. July 2002



Torque 31-37 N-m
(23-28lb-ft)

Pressure & Flow Compensator Parts

Model Code Feature (postion 17) = B, C

ITEM	DESCRIPTION	QTY
1	Pressure & Flow Compensator	1
2	Cap Screw	4
3	O-ring	3

⚠ WARNING

EATON recommends for positive displacement pumps that a relief valve be fitted between the pump and the load to protect against overload of the pump or system.

WARNING: NEVER ADJUST THE COMPENSATOR TO ALLOW THE PUMP OR THE HYDRAULIC SYSTEM TO EXCEED THEIR MAXIMUM RATED PRESSURES. REFER TO THE OPERATORS MANUAL FOR MAXIMUM PRESSURES OR CONTACT THE SUPPLIER.

EXCESSIVE PRESSURE MAY RESULT IN ABRUPT AND VERY SERIOUS FAILURES IN THE SYSTEM WHICH CAN CAUSE DEATH OR SERIOUS BODILY INJURY TO PERSONS NEARBY AND/OR DAMAGE THE PUMP.

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May 2004

EATON | Vickers

H Series Vickers Piston Pumps
Pressure & Flow Compensator Kit
Installation Information

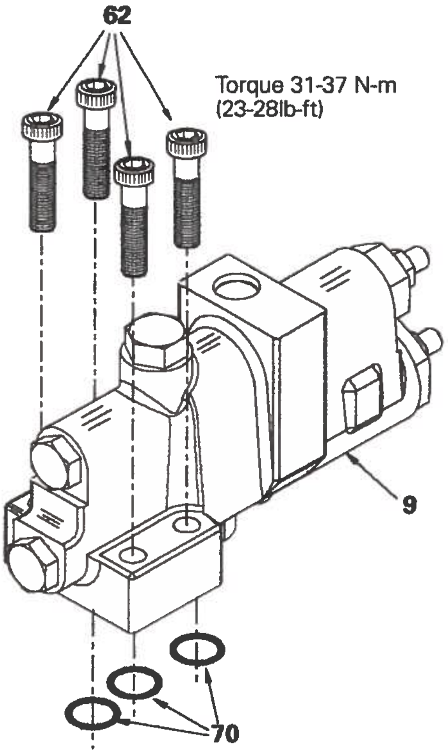
PVH057 / 63
PVH074 / 81
PVH098 / 106
PVH131 / 141

For more detailed information contact EATON Hydraulics at one of the addresses listed below.

Please reference the following documents:

- For Specifications and Performance Data see Catalog No. GB-C-2010.
- For parts Information for the PVH Piston Pump refer to Service Data below.
- When servicing PVH Piston Pump Compensators refer to these Service Data documents:

PVH057 / 063	M-2206-S
PVH074 / 081	M-2207-S
PVH098 / 106	M-2208-S
PVH131 / 141	M-2209-S



Torque 31-37 N-m
(23-28lb-ft)

Pressure & Flow Compensator Parts

Model Code Feature (postion 14) = B, E, M, N

ITEM	DESCRIPTION	QTY
9	Pressure & Flow Compensator	1
62	Cap Screw	4
70	O-ring	3

⚠ WARNING

EATON recommends for positive displacement pumps that a relief valve be fitted between the pump and the load to protect against overload of the pump or system.

WARNING: NEVER ADJUST THE COMPENSATOR TO ALLOW THE PUMP OR THE HYDRAULIC SYSTEM TO EXCEED THEIR MAXIMUM RATED PRESSURES. REFER TO THE OPERATORS MANUAL FOR MAXIMUM PRESSURES OR CONTACT THE SUPPLIER.

EXCESSIVE PRESSURE MAY RESULT IN ABRUPT AND VERY SERIOUS FAILURES IN THE SYSTEM WHICH CAN CAUSE DEATH OR SERIOUS BODILY INJURY TO PERSONS NEARBY AND/OR DAMAGE THE PUMP.

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May 2004

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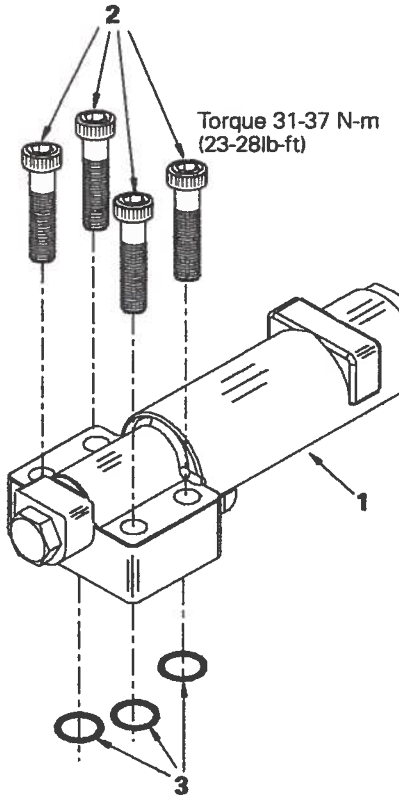
M Series Vickers Piston Pumps
Pressure Compensator Kit
Installation Information

PVM057 / 063
PVM074 / 081
PVM098 / 106
PVM131 / 141

For more detailed information contact EATON Hydraulics at one of the addresses listed below.

Please reference the following documents:

- For Specifications and Performance Data see Catalogs
    - V-PP-MC-0003-E Rev. August 2002
    - V-PP-MC-0004-E Rev. August 2002
- For parts Information for the PVM Piston Pump refer to Service Data below.
- When servicing PVM Piston Pump Compensators refer to this Service Data document:
    - V-PP-TP-0001-E Rev. July 2002



Torque 31-37 N-m
(23-28lb-ft)

Pressure Compensator Parts

Model Code Feature (postion 17) = A

ITEM	DESCRIPTION	QTY
1	Pressure Compensator	1
2	Cap Screw	4
3	O-ring	3

⚠ WARNING

EATON recommends for positive displacement pumps that a relief valve be fitted between the pump and the load to protect against overload of the pump or system.

WARNING: NEVER ADJUST THE COMPENSATOR TO ALLOW THE PUMP OR THE HYDRAULIC SYSTEM TO EXCEED THEIR MAXIMUM RATED PRESSURES. REFER TO THE OPERATORS MANUAL FOR MAXIMUM PRESSURES OR CONTACT THE SUPPLIER.

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May 2004

EATON | Vickers

H Series Vickers Piston Pumps
Torque Control Compensator Kit
Installation Information

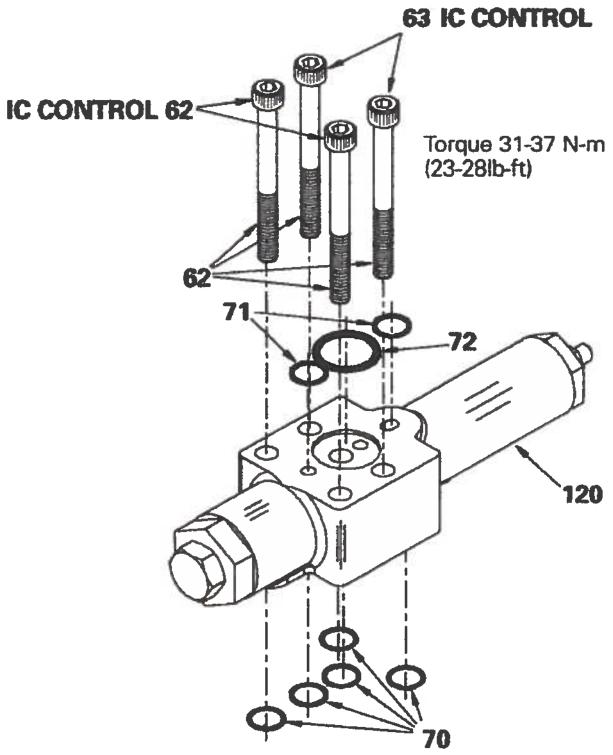
PVH057 / 63
PVH131 / 141
PVH074 / 81
PVH098 / 106

For more detailed information contact EATON Hydraulics at one of the addresses listed below.

Please reference the following documents:

- For Specifications and Performance Data see Catalog No. GB-C-2010.
- For parts Information for the PVH Piston Pump refer to Service Data below.
- When servicing PVH Piston Pump Compensators refer to these Service Data documents:

PVH057 / 063	M-2206-S
PVH074 / 081	M-2207-S
PVH098 / 106	M-2208-S
PVH131 / 141	M-2209-S



Torque Control Compensator Parts

Model Code Feature (postion 14) = D, E, J, M

ITEM	DESCRIPTION	QTY
62	Cap Screw	4 (Qty 2 - IC Control)
63	Cap Screw	2 (IC Control)
70	O-ring	5
71	O-ring	2
72	O-ring	1
120	Torque Control	1

⚠ WARNING

EATON recommends for positive displacement pumps that a relief valve be fitted between the pump and the load to protect against overload of the pump or system.

WARNING: NEVER ADJUST THE COMPENSATOR TO ALLOW THE PUMP OR THE HYDRAULIC SYSTEM TO EXCEED THEIR MAXIMUM RATED PRESSURES. REFER TO THE OPERATORS MANUAL FOR MAXIMUM PRESSURES OR CONTACT THE SUPPLIER.

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May 2004

EATON | Vickers

H Series Vickers Piston Pumps
Pressure Compensator Kit – Industrial Control
Installation Information

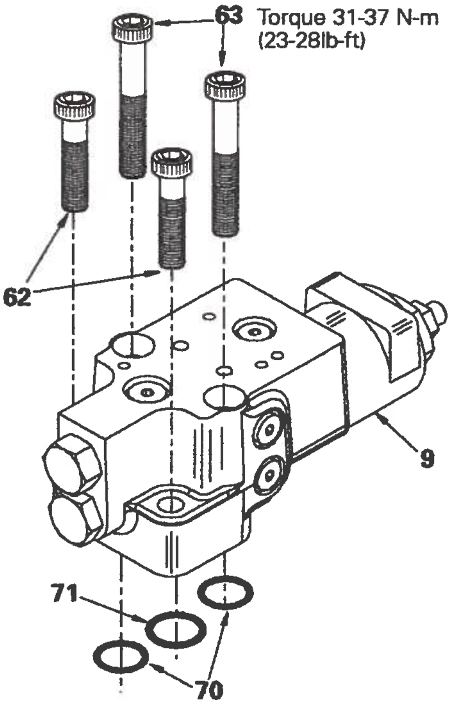
PVH057 / 63
PVH074 / 81
PVH098 / 106
PVH131 / 141

For more detailed information contact EATON Hydraulics at one of the addresses listed below.

Please reference the following documents:

- For Specifications and Performance Data see Catalog No. GB-C-2010.
- For installation and adjustment of the industrial control see Eaton document 676
- For parts Information for the PVH Piston Pump refer to Service Data below.
- When servicing PVH Piston Pump Compensators refer to these Service Data documents:

PVH057 / 063	M-2206-S
PVH074 / 081	M-2207-S
PVH098 / 106	M-2208-S
PVH131 / 141	M-2209-S



Pressure Compensator Control Parts

Model Code Feature (postion 14) = G, H, J

ITEM	DESCRIPTION	QTY
9	IC Control	1
62	Cap Screw	2
63	Cap Screw	2
70	O-Ring	2
71	O-Ring	1

⚠ WARNING

EATON recommends for positive displacement pumps that a relief valve be fitted between the pump and the load to protect against overload of the pump or system.

WARNING: NEVER ADJUST THE COMPENSATOR TO ALLOW THE PUMP OR THE HYDRAULIC SYSTEM TO EXCEED THEIR MAXIMUM RATED PRESSURES. REFER TO THE OPERATORS MANUAL FOR MAXIMUM PRESSURES OR CONTACT THE SUPPLIER.

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May 2004

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H Series Vickers Piston Pumps
Pressure Compensator Kit
Installation Information

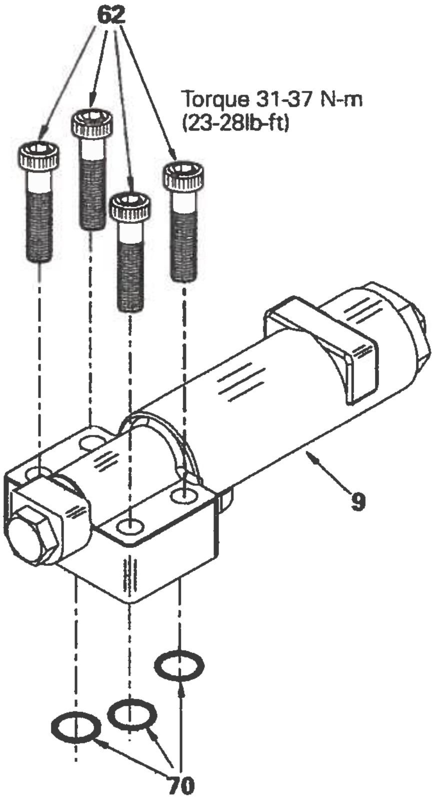
PVH057 / 63
PVH074 / 81
PVH098 / 106
PVH131 / 141

For more detailed information contact EATON Hydraulics at one of the addresses listed below.

Please reference the following documents:

- For Specifications and Performance Data see Catalog No. GB-C-2010.
- For parts Information for the PVH Piston Pump refer to Service Data below.
- When servicing PVH Piston Pump Compensators refer to these Service Data documents:

PVH057 / 063	M-2206-S
PVH074 / 081	M-2207-S
PVH098 / 106	M-2208-S
PVH131 / 141	M-2209-S



Torque 31-37 N-m
(23-28lb-ft)

Pressure Compensator Parts

Model Code Feature (postion 14) = A, D

ITEM	DESCRIPTION	QTY
9	Pressure & Flow Compensator	1
62	Cap Screw	4
70	O-ring	3

⚠ WARNING

EATON recommends for positive displacement pumps that a relief valve be fitted between the pump and the load to protect against overload of the pump or system.

WARNING: NEVER ADJUST THE COMPENSATOR TO ALLOW THE PUMP OR THE HYDRAULIC SYSTEM TO EXCEED THEIR MAXIMUM RATED PRESSURES. REFER TO THE OPERATORS MANUAL FOR MAXIMUM PRESSURES OR CONTACT THE SUPPLIER.

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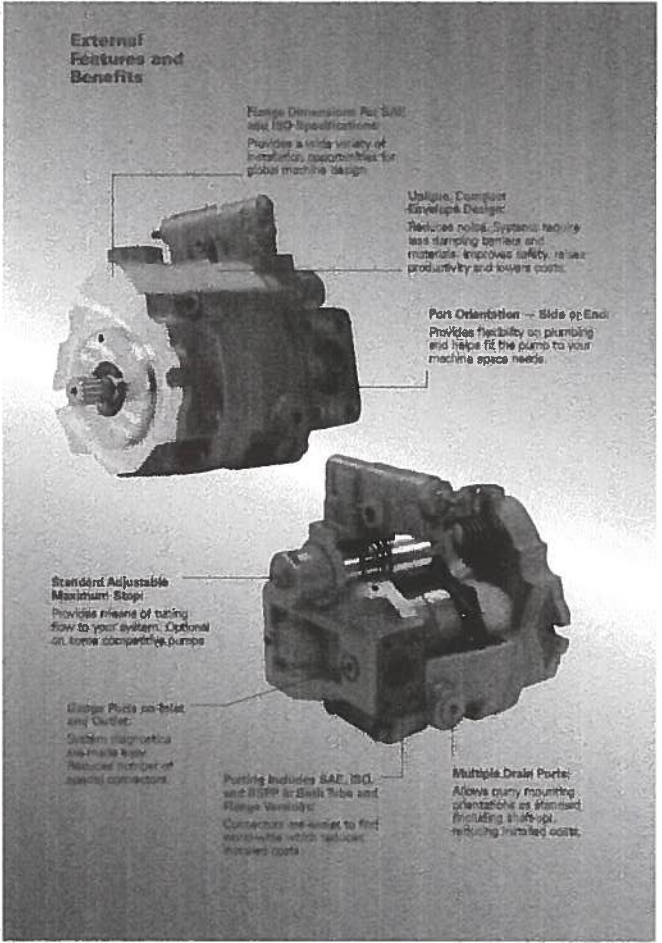
May 2004

External Features and Benefits



Flange Dimensions Per SAE and ISO Specifications:
Provides a wide variety of installation opportunities for global machine design.

Unique, Compact Envelope Design:
Reduces noise. Systems require less damping barriers and materials, improves safety, raises productivity and lowers costs.

Port Orientation — Side or End:
Provides flexibility on plumbing and helps fit the pump to your machine space needs.

Standard Adjustable Maximum Stop:
Provides means of tuning flow to your system. Optional on some competitive pumps.

Gauge Ports on Inlet and Outlet:
System diagnostics are made easy. Reduced number of special connectors.

Porting Includes SAE, ISO, and BSPP in Both Tube and Flange Versions:
Connectors are easier to find worldwide which reduces installed costs.

Multiple Drain Ports:
Allows many mounting orientations as standard including shaft-up, reducing installed costs.

M Series Model Code Selection

PVM	018	E	R	01	AE	01	AA	A	28	00	00	0	0	A	0	A
1 2 3	4 5 6	7	8	9 10	11 12	13 14	15 16	17	18 19	20 21	22 23	24	25	26	27	28

1, 2, 3 – **PRODUCT SERIES**
PVM – M Series Variable Piston Pump

4, 5, 6 – **DISPLACEMENT**
Fourteen displacements available
230 bar and 280 bar continuous ratings

7 – **VALVE PLATE**
E – Electric Motor Speeds

8 – **INPUT ROTATION**
R – Clockwise (righthand)
L – Counter-clockwise (lefthand)

9, 10 – **INPUT SHAFT**
Standard SAE and ISO splined versions
(Other configurations optional)

11 – **MOUNTING FLANGE**
Thirteen options in SAE and ISO mounts

12 – **MAIN PORT LOCATION**
E – End Ported
S – Side Ported

13, 14 – **MAIN PORT TYPE**
SAE & ISO tube ports and 4-bolt flange
(Other configurations optional)

15, 16 – **PUMP SPECIAL FEATURES**
00 – None (single shaft seal)
AA – Adjustable Maximum Displacement Stop and Single Shaft Seal (standard)
AB – Double Shaft Seal, Two Way

For complete model codes and information see catalog number V-PP-MC-0004-E.

17 – **CONTROL OPTIONS**
0 – None
A – Pressure Compensator
B – Pressure and Flow Compensator with Bleed Orifice
C – Pressure and Flow Compensator with Plugged Orifice
E – Industrial Control (57cc through 141cc only)

18, 19 – **PRESSURE COMPENSATOR SETTING**
00 – None
07 – 70 bar (Adjustable between 40 bar and 130 bar)
23 – 230 bar (Adjustable between 130 bar and 320 bar)
28 – 280 bar (Adjustable between 130 bar and 320 bar)

20, 21 – **FLOW COMPENSATOR SETTING**
00 – None
11 – 11 bar setting
20 – 20 bar setting
24 – 24 bar setting

22, 23 – **TORQUE LIMITER SETTING**
00 – None (Not available on M Series)

24 – **COMPENSATOR SPECIAL FEATURES**
0 – None

25 – **AUXILIARY MOUNTING PAD**
0 – None
(Auxiliary mounting available on all frame sizes)

26 – **PAINT**
0 – No paint
A – Standard Blue Paint

27 – **CUSTOMER IDENTIFICATION**
0 – None (Contact Eaton for Options)

28 – **DESIGN CODE**
A – A (Initial Release)

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Supersedes [illegible]
July 2004

EATON | Vickers

M Series Industrial Axial Piston Pumps

VICKERS®

M Series 280 Bar (4000 psi) For Industrial Applications

Medium Pressure, High Performance, Quiet Operation

As system performance demands trend toward higher pressure, Eaton's new M Series pumps are prepared to meet your needs. These compact pumps provide a rugged alternative when higher power demands are made on your system.

Eaton's M Series pumps cover medium pressure industrial equipment applications. Like other Eaton pumps, the M Series incorporates proven engineering design, as well as quality manufacturing techniques and operating features.

The Right Pump for the Right Application.

With the new M Series Axial Piston pumps, Eaton now offers a selection of displacements to provide system design flexibility. [illegible] the low to medium pressure application range with displacements from 18 cm³ [illegible] to 141 cm³ [illegible]. With such a broad offering of [illegible] industrial [illegible], the M Series is the solution to many pump needs.

Quiet Performer.

[illegible]

Built for Long Life.

[illegible] also show overhaul costs can be reduced because of the ease of replacing worn rotating parts when rebuilding major machine systems.

Efficient controls in the M Series allow the [illegible] of cooling [illegible] and the use of a smaller, less expensive system design. Another option is to use the same cooling capacity and increase system flow capability, thus improving performance and customer satisfaction.

Fluids.

M Series pumps are fully capable of operating with many kinds of hydraulic fluids used in industrial systems. High water content and phosphate ester fluids can be [illegible], in addition to the typical petroleum [illegible] and synthetic fluids.

Lower Installed and Operating Costs.

The M Series line provides a medium pressure range of pumps that reduce both the installed cost and operating cost for customers' applications. This is achieved by incorporating many standard features others offer as options, such as adjustable maximum displacement stops and gauge ports.

A design constraint of 30,000 hours B_{10} bearing life in industrial applications provides long component and system operation without costly breakdowns and maintenance. Replaceable wear surfaces ensure that a rebuild is done quickly and less expensively than by the purchase of a new pump.

The Eaton tradition of full [illegible] capability is continued with the M Series. Both SAE and ISO mounting versions are provided. Ports in both English and metric designs are standard options. [illegible] connections allow the [illegible] design to be selected for the system application, including other component [illegible].

Designed for Many Applications.

The flexibility built into these M Series pumps makes them ideal for many applications including:

- Automotive Transfer Lines
- Process Industry Machines
- Clamping Fixtures
- Robotic Lasers
- Tool Changers for Machining
- Wind Turbines
- Entertainment Rides
- Tube Forming and Bending
- Sheet Metal Brakes
- Blow Molding Machines

Many popular control options are also available. See your application brochure for details.

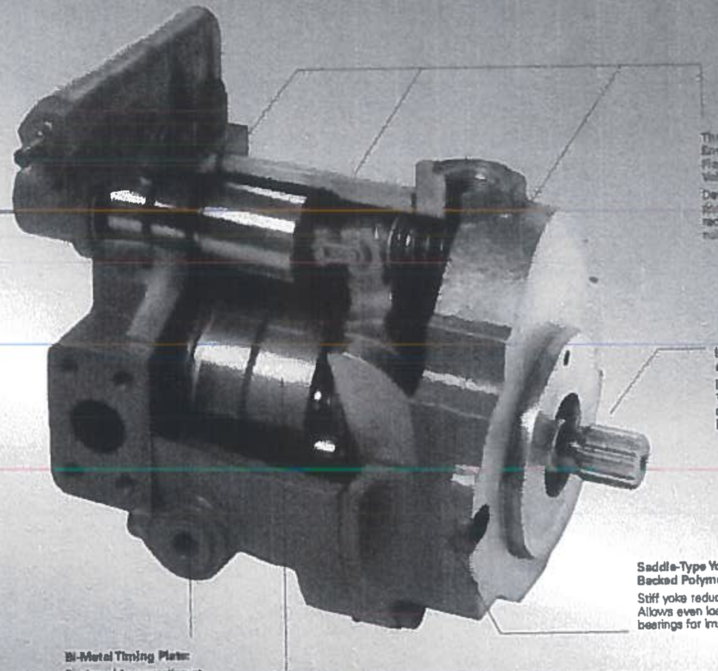
PVM	DISPLACEMENT		
018	18,0 cm³/r	[1.10 in³/r]	(280 bar MAX)
020	21,1 cm³/r	[1.29 in³/r]	(320 bar MAX)
[illegible]	[illegible]	[2.75 in³/r]	([illegible] bar MAX)
[illegible]	[illegible]	[illegible]	([illegible] bar MAX)
057	57,4 cm³/r	[3.50 in³/r]	([illegible] bar MAX)
063	[illegible]	[3.85 in³/r]	([illegible] bar MAX)
[illegible]	[illegible]	[illegible]	([illegible] bar MAX)
[illegible]	[illegible]	[illegible]	([illegible] bar MAX)
[illegible]	[illegible]	[illegible]	([illegible] bar MAX)
[illegible]	[illegible]	[illegible]	([illegible] bar MAX)
[illegible]	[illegible]	[illegible]	([illegible] bar MAX)
[illegible]	[illegible]	[illegible]	([illegible] bar MAX)

Internal Features and Benefits

NOISE LEVEL (dBA)

MODEL	DISP	PRESS (BAR) 230	PRESS (BAR) 280
PVM018	FF CD	65 64	64 [illegible]
PVM020	FF CD	[illegible] [illegible]	
[illegible]	FF CD	[illegible] [illegible]	71 67
[illegible]	FF CD	72 [illegible]	
[illegible]	FF CD	73 [illegible]	[illegible] [illegible]
[illegible]	FF CD	[illegible] [illegible]	
PVM074	FF CD	71 67	[illegible] [illegible]
[illegible]	FF CD	74 [illegible]	
[illegible]	FF CD	[illegible] [illegible]	77 74
[illegible]	FF CD	[illegible] [illegible]	
[illegible]	FF CD	[illegible] 73	[illegible] [illegible]
[illegible]	FF CD	[illegible] [illegible]	

NFPA Equivalent @ 1800 rpm 120 F



Single Control Piston

Reduces loading on pump yoke. Size of pump is reduced allowing installation in tighter locations.

Three Piece Pump Envelope - Flange, Housing and Valve Block:

Design is stiffer and incorporates features that reduce structure-borne noise. Pumps are quieter.

High Load Bearings and Stiff Drive Shaft:

B10 bearing life of 10,000 hours reduces operating costs. Extends machine life.

Saddle-Type Yoke with Steel Backed Polymer Bearings:

Stiff yoke reduces deflection. Allows even loading of bearings for improved life.

Strong, Proven, Rotating Group Assembly:

Provides 280 bar (4000 psi) continuous, 320 bar (4600 psi) intermittent pressure requiring less maintenance cost.

Bi-Metal Timing Plate:

Designed for operation at industrial equipment speeds. Improves pump filling characteristics which extends pump life and reduces fluid-borne noise.

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Revised 10/00

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Installation Information

No. 04-06-0424-EN-1000
Revised October, 2000

Replaces 04-424

Heavy Duty Series 0 and 1
Eaton® Pump Controls

RE (Remote Electric) Control

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RE (Remote Electric) Control Conversion Kits – Parts List 5,6
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Start-up and Test Proceedures 33
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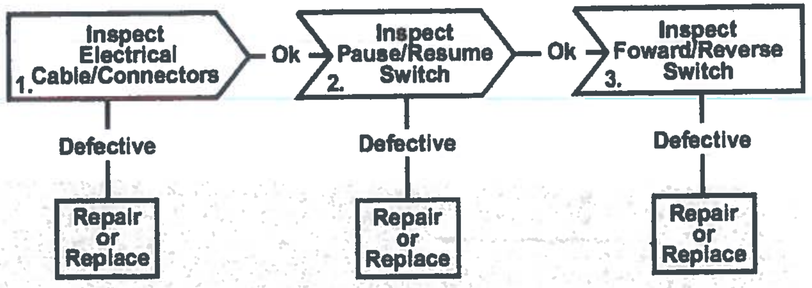
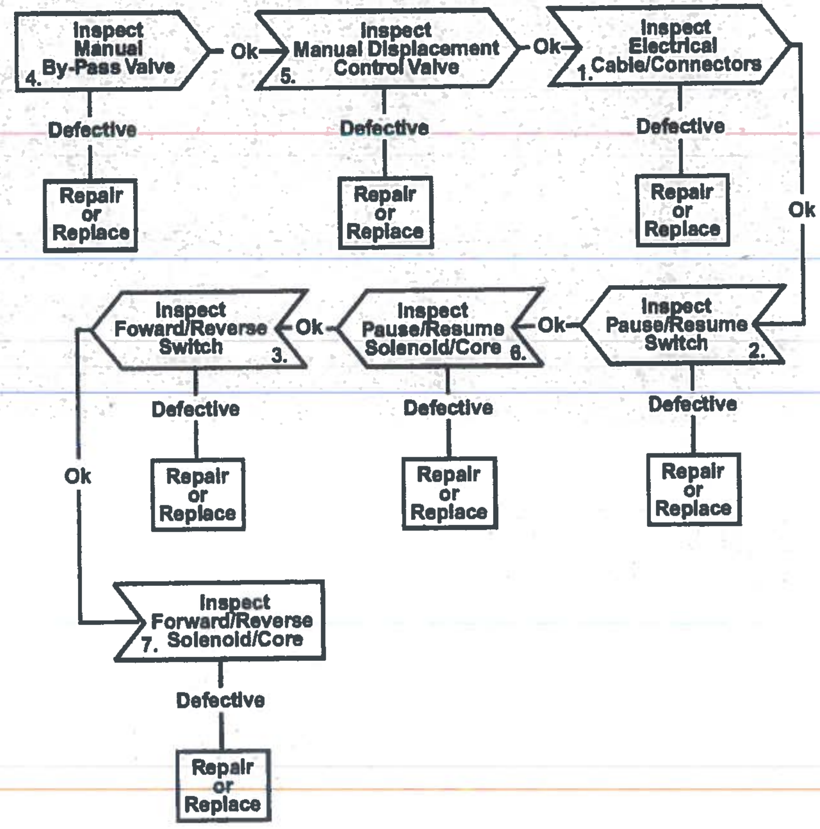
Information contained in this installation booklet is accurate as of the publication date and is subject to change without notice. Performance values are typical values. Customers are responsible for selecting products for their applications using normal engineering methods.

Pump will work from only one control station


Inspect Electrical 1. Cable/Connectors
Ok
Inspect Pause/Resume 2. Switch
Ok
Inspect Foward/Reverse 3. Switch
Defective
Repair or Replace
Defective
Repair or Replace
Defective
Repair or Replace

Pump will not stroke or destroke in one or both directions

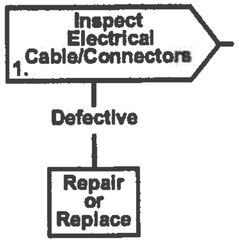

Inspect Manual 4. By-Pass Valve
Ok
Inspect 5. Manual Displacement Control Valve
Ok
Inspect Electrical 1. Cable/Connectors
Defective
Repair or Replace
Defective
Repair or Replace
Defective
Repair or Replace
Ok
Inspect Pause/Resume Switch 2.
Ok
Inspect Pause/Resume Solenoid/Core 6.
Ok
Inspect Foward/Reverse Switch 3.
Defective
Repair or Replace
Defective
Repair or Replace
Defective
Repair or Replace
Ok
Inspect Forward/Reverse 7. Solenoid/Core
Defective
Repair or Replace

Fault- Logic Troubleshooting

This Fault-Logic Trouble Shooting Guide is designed as a diagnostic aid in locating possible remote electrical control problems by the user. Match the electrical control problems with the problem statements and follow the action steps in the box diagrams. This will help in correcting minor problems, eliminating unnecessary machine down time.

Explanatory Diagram

Symptom:



Following the fault-logic diagrams are diagram action comments to further help explain the action steps shown in the diagrams.

Where applicable, the action comment number of the statement appears in the action block of the diagram.

Diagram Action Step Comments

1. Inspect Electrical Cable Connectors
   a. Disconnected cable connector.
   b. Corroded connector pins.
   c. Broken or cut electrical cable.

2. Inspect Pause/Resume Switch
   a. Corroded connector terminal.
   b. Defective pause/resume switch.

3. Inspect Forward/Reverse Switch
   a. Corroded connector terminal.
   b. Defective forward/reverse switch.

4. Inspect Manual By-Pass Valve
   a. Manual by-pass valve in partial or open position.

5. Inspect Manual Displacement Control Valve
   a. Plugged control orifice.
   b. Damaged mounting gasket.
   c. Broken control connector pin.
   d. Broken or missing control linkage pin(s).
   e. Galled, stuck or bent control spool.

6. Inspect Pause/Resume Solenoid/Core
   a. Corroded connector pins.
   b. Defective Electrical Solenoid.
   c. Defective Solenoid core.

7. Inspect Forward/Reverse Solenoids/Core
   a. Corroded connector pins.
   b. Defective Electrical Solenoid.
   c. Defective Solenoid core.

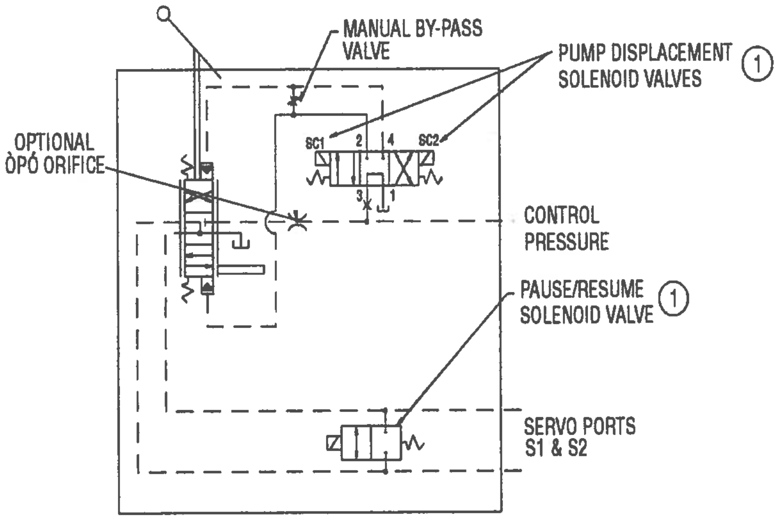
Introduction

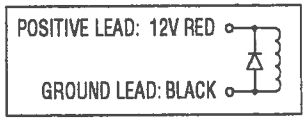
The following information describes the installation of the Eaton® RE Control on Heavy Duty Series 0 and 1 hydrostatic pumps. Review this information to become familiar with the procedures required before beginning any installation.

⚠CAUTION Make sure the battery is disconnected and the engine is not running. Make sure the parking brake is engaged and other peripheral equipment is disengaged.

NOTE: Hydraulic fluid can leak from the control valve assembly when removing. First shut off the hydraulic reservoir to the pump and drain the hydraulic fluid from the displacement control valve.

Remote Electric (RE) Control Valve Schematic





① All three coils have this schematic configuration.
Coils are 12VDC 9.8 OHMS at 200C,
1.22 AMPS initial current draw.

② Eaton Cutler Hammer 8530 K9 single pole (On-Off) switch or equivalent.

③ Eaton Cutler Hammer 8530 K2 single pole (Momentary-Off-Momentary) switch or equivalent.

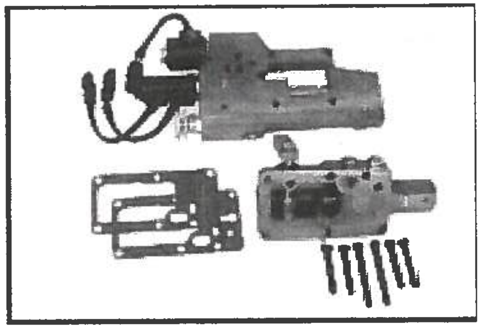
④ RE mating connectors are Delphi Packard Weather Pack

	Part Numbers
Connector Body:	12015792 (Qty 3)
Terminal:	12089188 (Qty 6)
Cable Seal:	12015323 (Qty 6)

Eaton Kit Part Number: 990756-000
(kit includes hardware for all three mating connectors)

RE (Remote Electric) Control Conversion Kits – There are two types of conversion kits available to convert Models 33-64 Eaton heavy duty Series (0) and (1) hydrostatic pumps to include a Remote Electric Control. One type contains both the RE Control and link kits with a manual displacement control and the second conversion kit contains only the RE Control.

Manual Displacement Controls:



Available (P) Orifice Sizes:
-036
-044
-052
-057
-065
-073

990814-XXX* (replaces 990785-XXX) with Manual Displacement Control configured with 3, 2-pin connectors (shown above)

QTY	Part Number	Description
1 ea	111883-013	RE Control S/A
2 ea	110213-000	Gasket
4 ea	95862-225	Cap Screw
2 ea	95862-300	Cap Screw
1 ea	110470-XXX	Manual Displacement Pump Control Valve with Control Supply Orifice

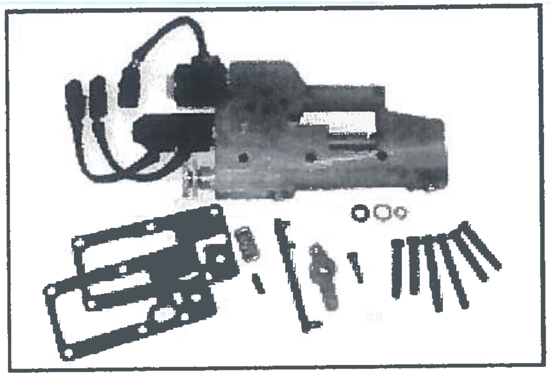
990834-XXX* (replaces 990755-XXX) with Manual Displacement Control configured with 1, 2-pin Pause/Resume connector and 1, 4-pin stroking valve connector (not shown)

QTY	Part Number	Description
1 ea	111885-013	RE Control S/A
2 ea	110213-000	Gasket
4 ea	95862-225	Cap Screw
2 ea	95862-300	Cap Screw
1 ea	110470-XXX	Manual Displacement Pump Control Valve with Control Supply Orifice

*The XXX designates the (P) orifice diameter installed in the manual displacement control.

Kits with Control only:

Installation of this kit requires modifying the standard manual displacement control to incorporate a new Control Link S/A and a new Control Connector S/A.



990820-000 (replaces 990755-XXX)

without Manual Displacement Control configured with 3, 2-pin connectors (shown above)

QTY	Part Number	Description
1 ea	111883-013	RE Control S/A
1 ea	102765-000	Control Link S/A
1 ea	110468-000	Control Connector S/A
2 ea	110213-000	Gasket
4 ea	95862-225	Cap Screw
2 ea	95862-300	Cap Screw
1 ea	96201-088	Slotted Pin
1 ea	104713-000	Dust Seal
1 ea	8761-012	O-Ring
2 ea	96098-025	Retaining Ring
1 ea	8761-016	O-Ring
1 ea	111820-000	Spool Spring
1 ea	96273-075	Shoulder Bolt

Replacement Solenoids/Coils (Included in 111883-013 and 111885-013 RE Control S/A)

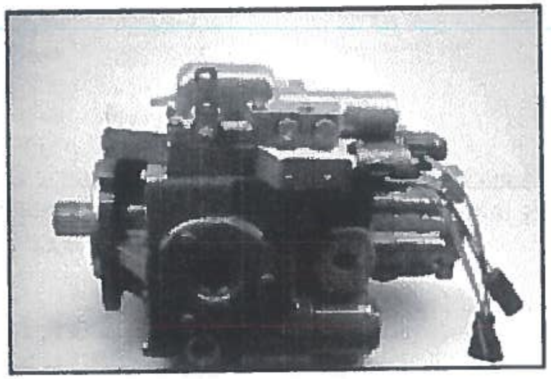
QTY	Part Number	Description
1 ea	109379-001	Solenoid Cartridge NC (Pause/Resume)
1 ea	201567-000	12V Coil with Diode with 2 pin connector
1 ea	202603-000	4-Way Solenoid Cartridge
1 ea	201546-000*	12V Coil with Diode with 2-pin connector
1 ea	111207-000**	12V Coil with Diode with 4 pin connector

*(If replacing complete assembly use two coils)

**(this is a subassembly and includes 2 coils)

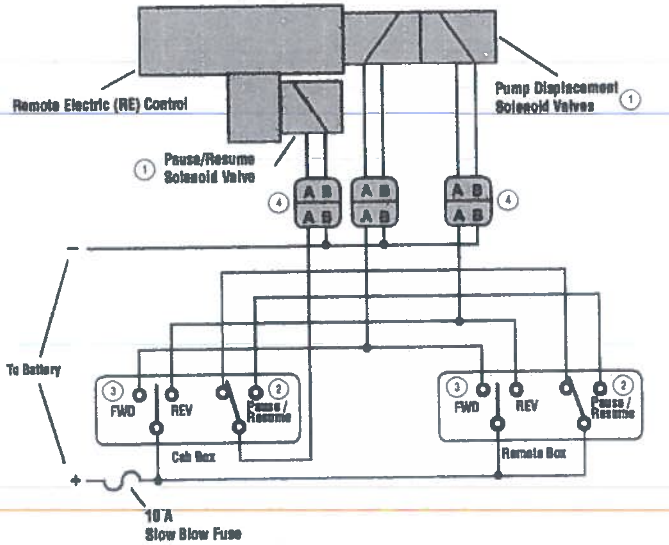
Step 26

The heavy duty variable displacement pump with remote electric control is now ready for startup and test.



Typical Remote Electric (RE) Control Connection Diagram

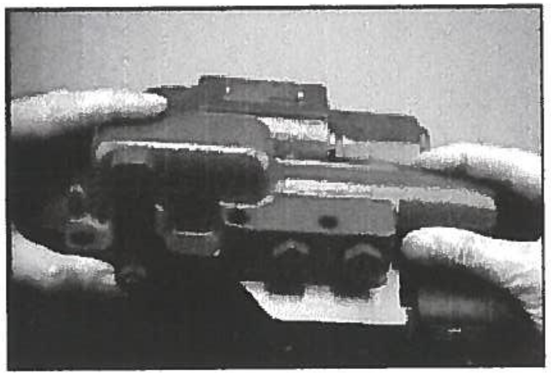
This is an example of an application with two operator stations. Switches, power fuse, battery and wire harness are supplied by customer.



Step 24

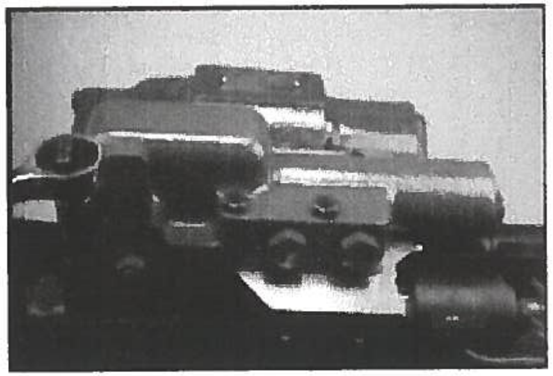
Carefully set the manual control assembly on the remote electric control using caution not to disturb the previously installed control gasket.

IMPORTANT: The control and swashplate links must fold backwards toward the rear or charge pump end of the pump.



Step 25

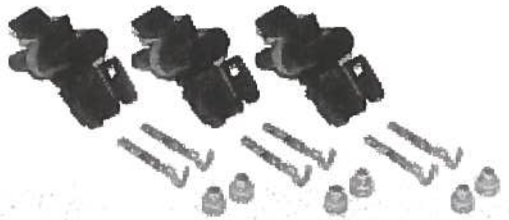
Install the new retaining cap screws. Torque cap screws to 16 ft. lbs. [22 Nm].



`990815-000 (replaces 990787-XXX)
without Manual Displacement Control configured with 1, 2-pin connector and 1, 4-pin connector (not shown)

QTY	Part Number	Description
1 ea	111885-013	RE Control S/A
1 ea	102765-000	Control Link S/A
1 ea	110468-000	Control Connector S/A
2 ea	110213-000	Gasket
4 ea	95862-225	Cap Screw
2 ea	95862-300	Cap Screw
1 ea	96201-088	Slotted Pin
1 ea	104713-000	Dust Seal
1 ea	8761-016	O-Ring
2 ea	96098-025	Retaining Ring
1 ea	8761-016	O-Ring
1 ea	111820-000	Spool Spring
1 ea	96273-075	Shoulder Bolt

990756-000 Mating Weather Pack connector kit
(for use with conversiton kit numbers 990814-XXX, 990820-000)
Kit contains (3) 2 pin Weather Pack connectors



990842-000 Mating Weather Pack connector kit
(for use with conversiton kit numbers 990824-XXX, 990815-000)
Kit contains (1) 2 pin Weather Pack connector
(1) 4 pin Weather Pack connector

Mating Connector Kits include connector bodies, terminals and cable seals.

990860-000

Without Manual Displacement Control. Configured with 3, 2-pin connector. Includes .141" orifice in pause/resume valve.

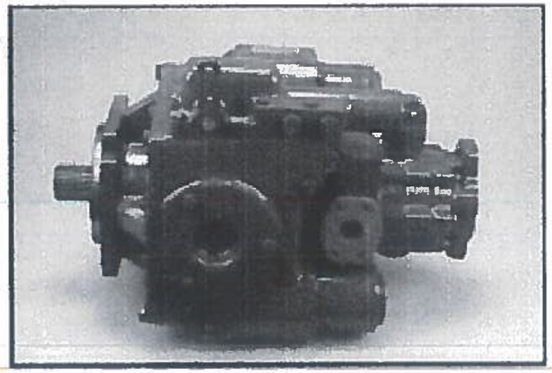
QTY	Part Number	Description
1 ea	113675-001	RE Control S/A
1 ea	102765-000	Control Link S/A
1 ea	110468-000	Control Connector S/A
2 ea	110213-000	Gasket
4 ea	95862-225	Cap Screw
2 ea	95862-300	Cap Screw
1 ea	96201-088	Slotted Pin
1 ea	104713-000	Dust Seal
1 ea	8761-012	O-Ring
2 ea	96098-025	Retaining Ring
1 ea	8761-016	O-Ring
1 ea	111820-000	Spool Spring
1 ea	96273-075	Shoulder Bolt

Installation of the RE Control Conversion Kt on a Pump

Disassembly

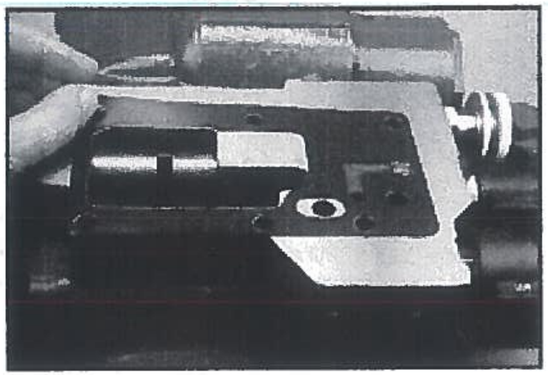
Step 1

Clean the pump thoroughly. If conversion will be performed without removing pump from machine, case fluid level will need to be lowered below control mounting surface.



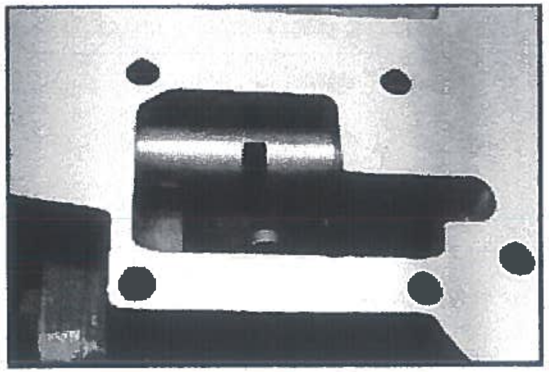
Step 22

Install the second new control gasket by again aligning the fluid passage ports and retaining cap screw holes.



Step 23

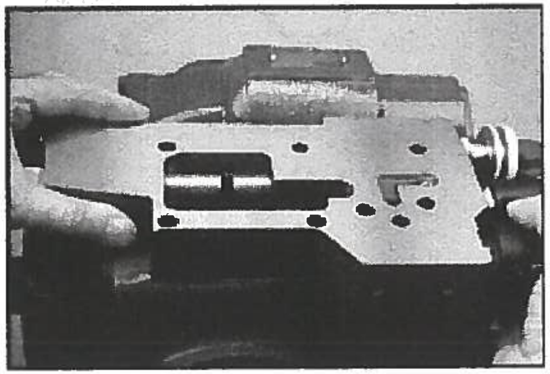
When assembling the manual displacement control, insert the pin on the control link into the swashplate link. Slide the pin on the connector into the slot machined in the remote electric control piston as shown here.



Step 20

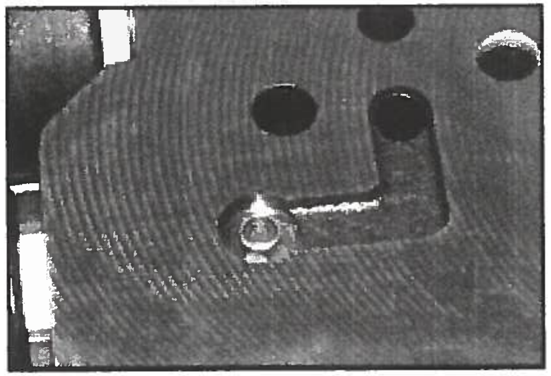
Carefully install the new remote electric control by aligning the fluid passage ports and retaining cap screws hole.

CAUTION: Care must be used when installing the control. Do not dislodge the previously installed gasket or disturb the swashplate link from the upright position.



Step 21

Shown here is the orifice located in the remote electric control. In most cases it will not be necessary to remove this orifice, unless the orifice needs to be replaced. You can remove this orifice with a 1/4" socket or offset box end wrench. **Note:** Torque the orifice to 18 to 20 lbf-in.

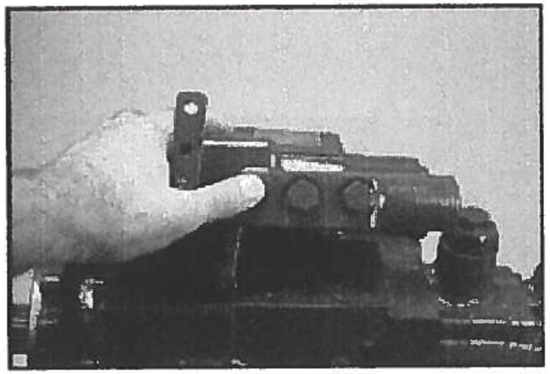


Step 2

To remove the manual displacement control, use a 1/2 inch socket or open-end wrench and remove the control's retaining cap screws and discard.

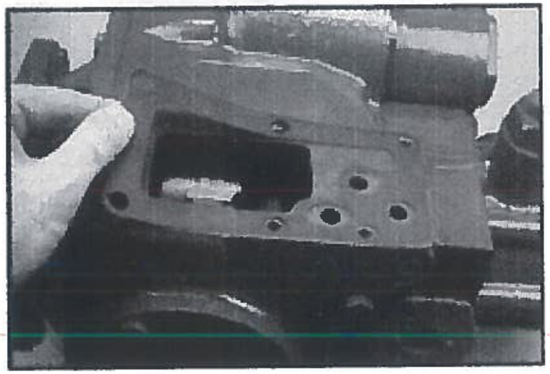
Step 3

Next, carefully lift the control valve assembly upward and slide away from the pump to disengage the control link from the swashplate link.

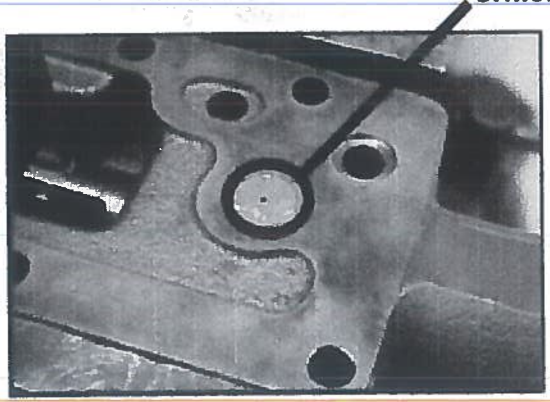


Step 4
Remove the control gasket from the pump housing and discard.

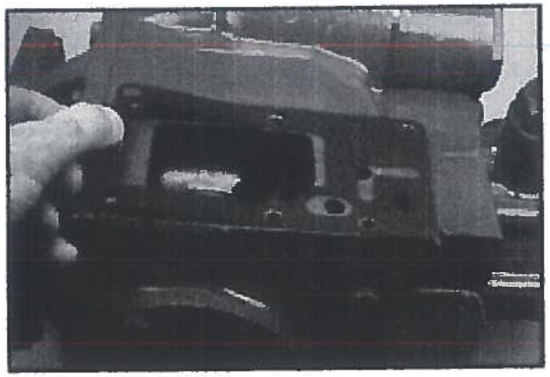
NOTE: If installing an RE Control kit which includes the manual displacement control (Kit Number 990834-XXX or 990814-XXX), skip to step 18 of the reassembly process.



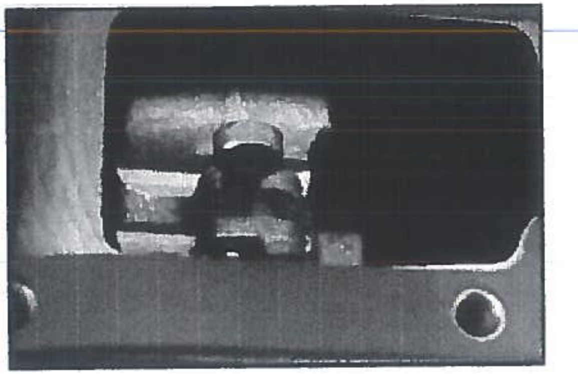
Step 5
Support the control assembly in a vise with the link facing upward. In most cases it will not be necessary to remove the orifice that is staked in the housing unless a different orifice size is desired. The orifice size is stamped on the orifice. (orifice must be .073 or less)



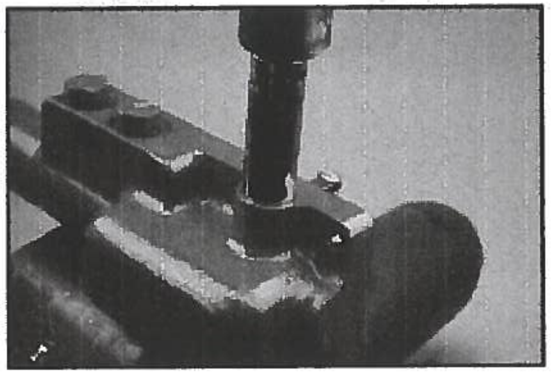
Step 18
Install a new gasket by aligning the fluid passage and retaining cap screw holes.



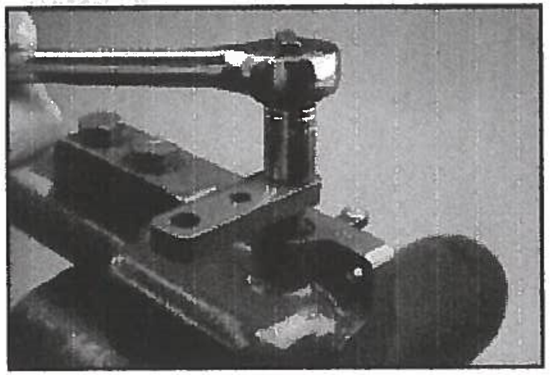
Step 19
Apply a small amount of petroleum jelly to the swashplate link where it is attached to the swashplate. This will be used to help it stand in the upright position. It will be a lot easier to install the control's link to the swashplate link if its is in the upright position.



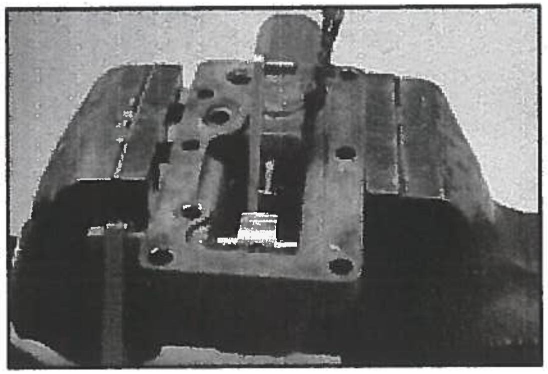
Step 16
Lubricate and install the new dust seal over the shaft with the lip of the seal facing upward. Using a deep-wall socket or similar tool, carefully press or drive the seal in until it contacts the bottom of the counterbore in the control housing.



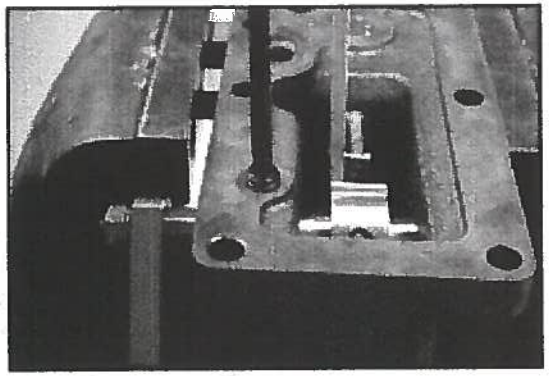
Step 17
Install the handle on the shaft. Position of the handle should be approximately parallel with the link. Install the lock washer and retaining nut. Torque nut to 16 to 19 ft. lb. [21,7 to 25,8 Nm].



Step 6
Remove the linkage from the spool. This is done by using a very small pair of 90 degree external retaining ring pliers to remove the retaining ring from the link.



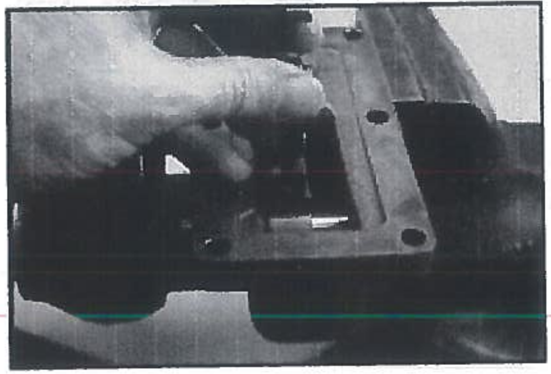
Step 7
Use a 3/16 inch hex or Allen wrench to back out the shaft set screw at least two full turns.



Step 8

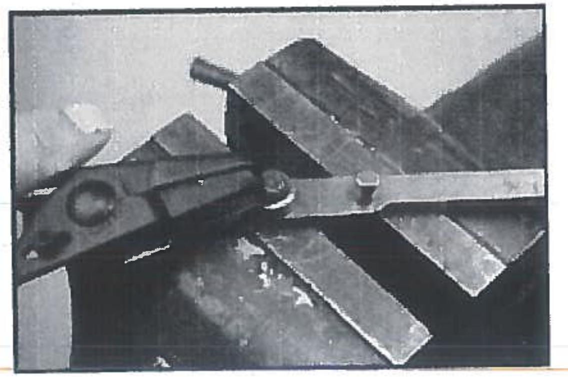
With the shaft set screw backed out, slide the shaft assembly over to disengage the link from the control spool. Next, pull the link assembly upward past the spool and slide it over to disengage it from the connector.

NOTE: Use a small screwdriver or similar tool to push the control spool inward a little to allow the link assembly to pass by.



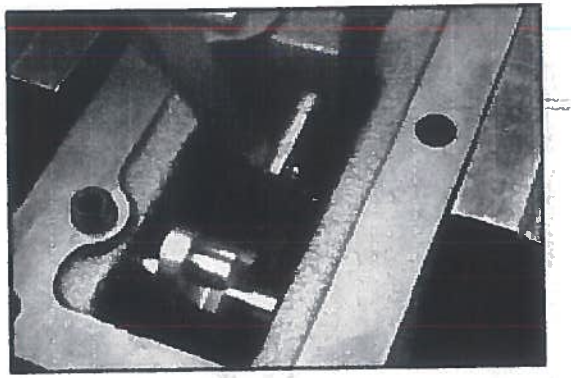
Step 9

With the link assembly removed, remove the retaining ring and separate the two links.



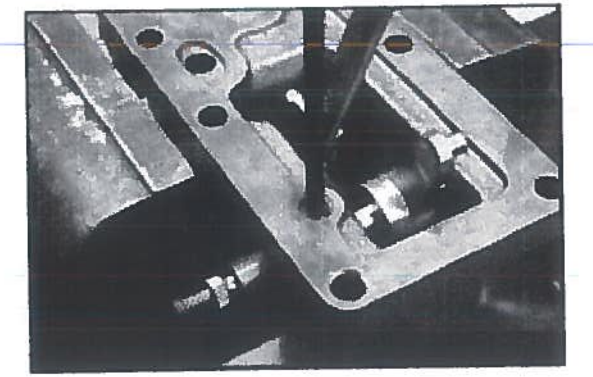
Step 14

Assemble the link to the shaft by aligning the link pin with the hole in the spool and slide the assembly over to engage. Install new retaining ring.



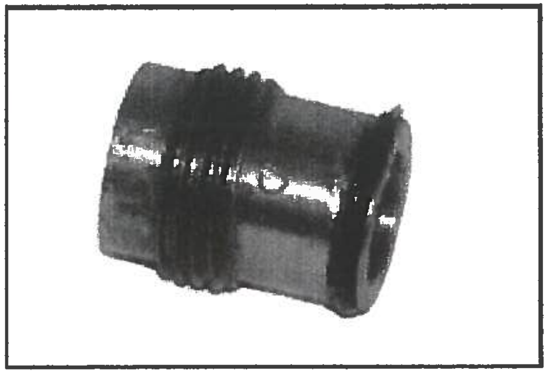
Step 15

Center the shaft and align set screw with groove in the shaft. Tighten set screw until it bottoms out, then back it out 1/4 turn.



Step 4

Lubricate and install the new O-ring onto the spring box adjustment screw.



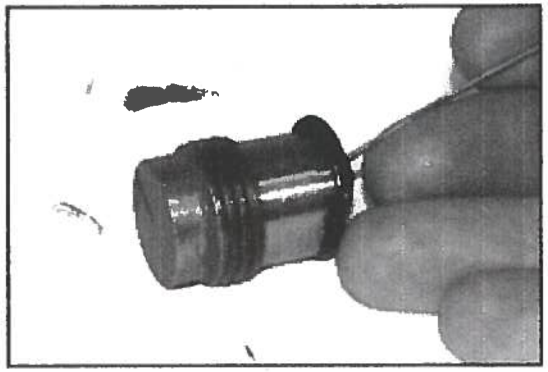
Step 5

Screw the spring box adjustment screw in until the witness mark and location marks line up with the set screw hole (a flashlight may be needed to help locate the witness mark).

Note: To make sure the spool is in the neutral postion move the spool back and forth. You should only feel spring pressure when you move the spool back and forth. If there is play in the spool, turn the spring box adjustment screw in or out to remove the play. Do not compress the spool spring while moving spool back and forth.

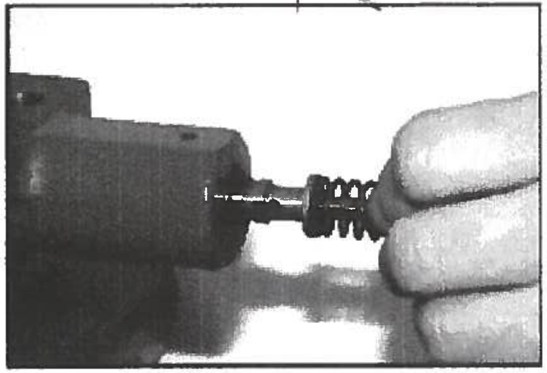
Step 18

Using an O-ring pick or similar tool remove the O-ring from the spring box adjustment screw and discard.

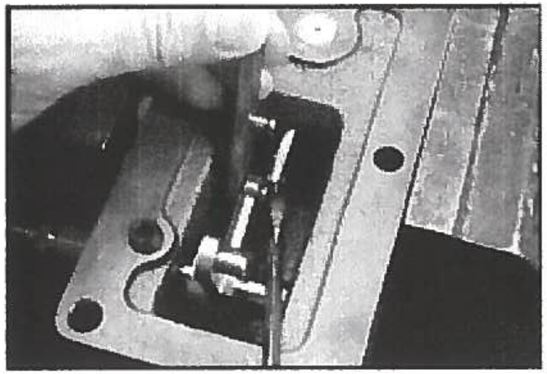


Step 19

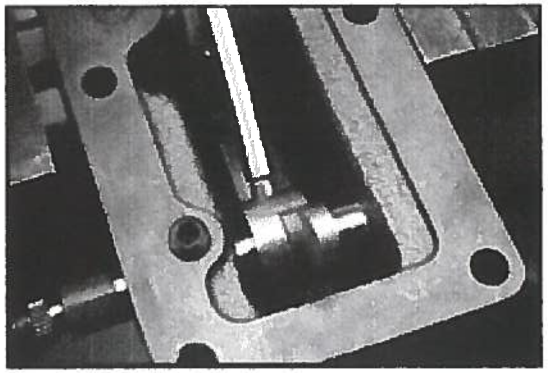
With the spring box adjustment screw removed, carefully push the control spool assembly out through the controller housing.



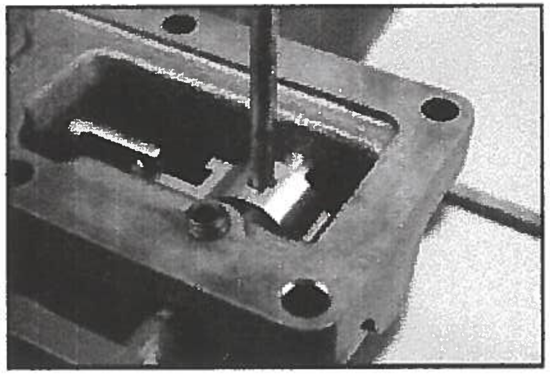
Step 12
Using a small screwdriver, push the control spool inward, just enough to allow the lower link to pass by.



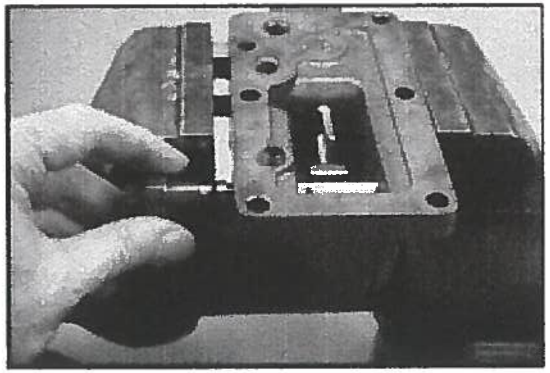
Step 13
Align the connector pin with the cross hole in the control shaft. After aligning, use a straight punch and drive the connector pin inward until the pin is centered in the connector.



Step 10
With the control assembly firmly supported in a vise, use 1/4 inch punch and drive the connector pin inward to separate the shaft assembly from the connector.



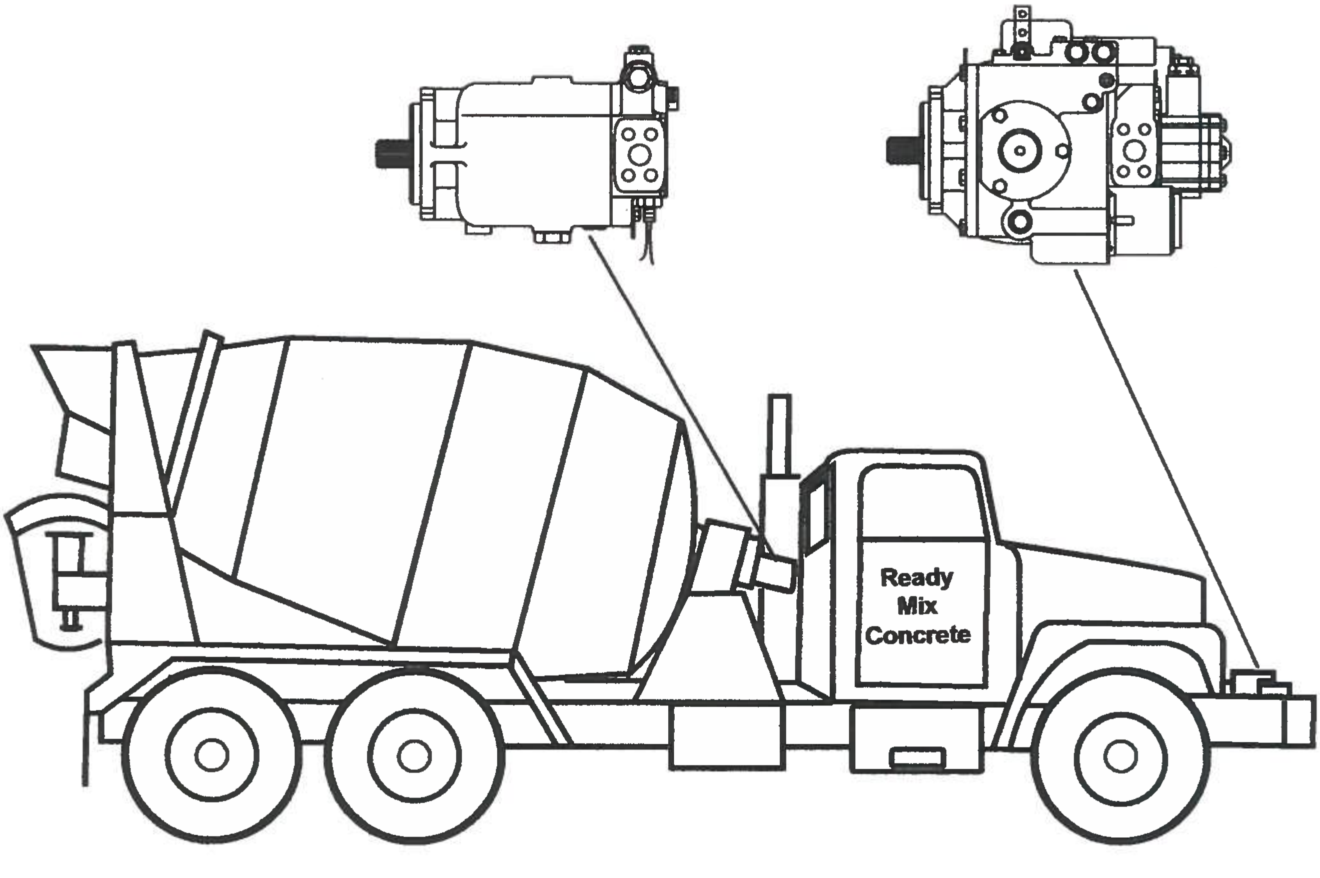
Step 11
Remove the shaft and connector from the control housing assembly.



tall

Eaton®
Heavy Duty Hydrostatic Transmissions

No. 3-406
July, 1995



Troubleshooting Guide for Eaton Hydrostatic Transmissions used on Concrete Mixers

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Introduction 2
Typical Hydrostatic System 3
Gauge Requirements, Gauge Port Size and Locations 4-5
Typical Pressure Readings 6
Fault-Logic Troubleshooting 7-11
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Hydraulic Fluid Recommendations 14-15

Introduction

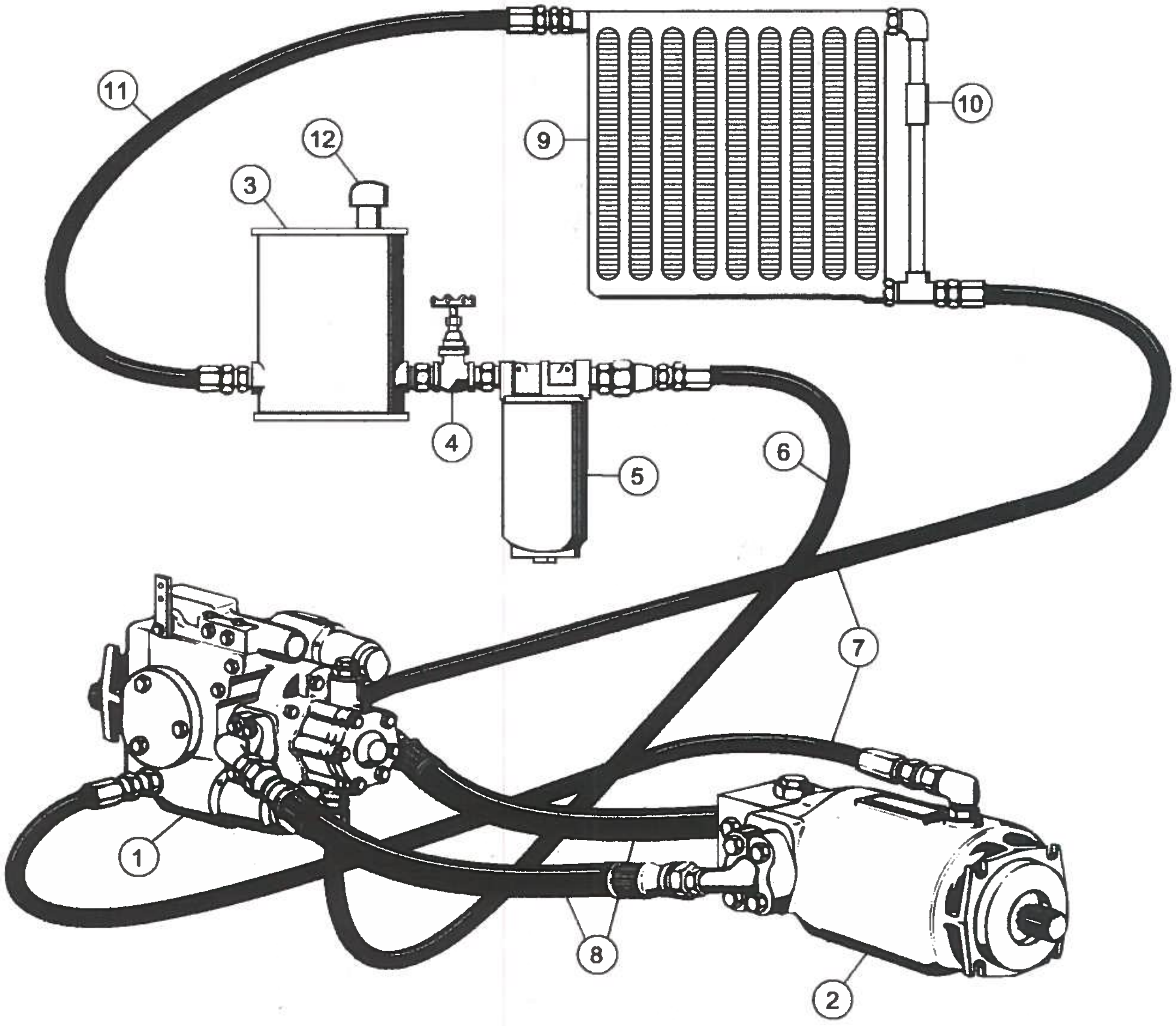
This manual provides troubleshooting information for a typical hydrostatic system. It will help you to diagnose minor problems that may occur with Eaton Heavy Duty Hydrostatic Transmissions.

The following publications are also available for Eaton Heavy Duty Hydrostatic Transmissions:

Technical Data for Hydrostatic Closed-Circuit Schematics	No. 3-403
Eaton Heavy Duty Hydrostatic Start-Up Procedure	No. 2-402
Eaton Hydrostatic Variable Pump Repair Manual (Series 0)	No. 7-603
Eaton Hydrostatic Variable Pump Repair Manual (Series 1)	No. 7-606
Eaton Hydrostatic Fixed Pump Repair Manual (Series 0)	No. 7-122
Eaton Hydrostatic Fixed Pump Repair Manual (Series 1)	No. 7-127

Typical Hydrostatic System

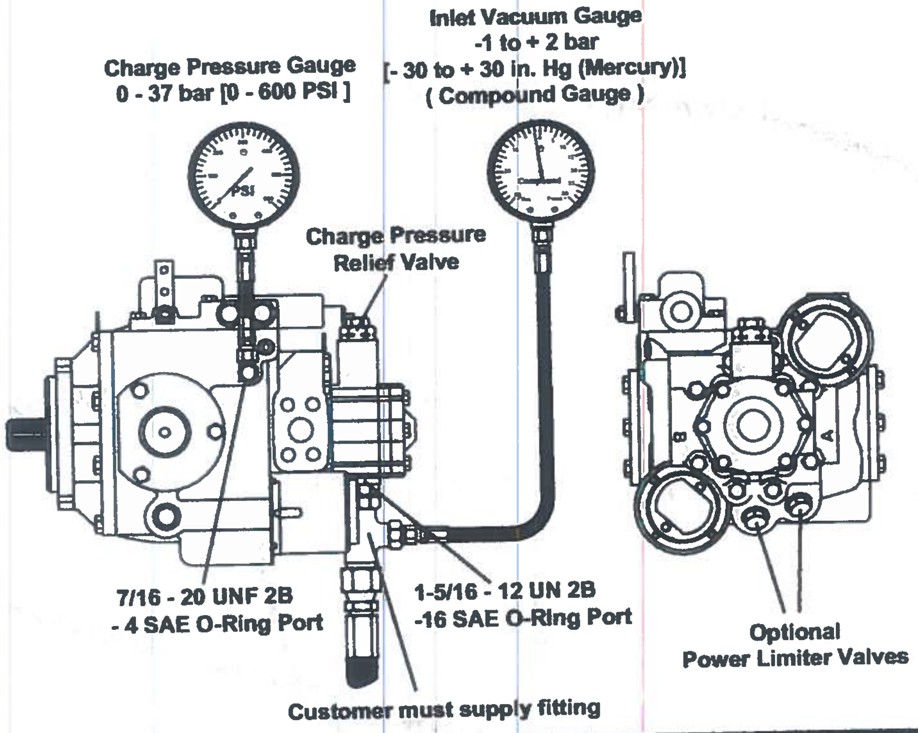
Variable Pump-Fixed Motor



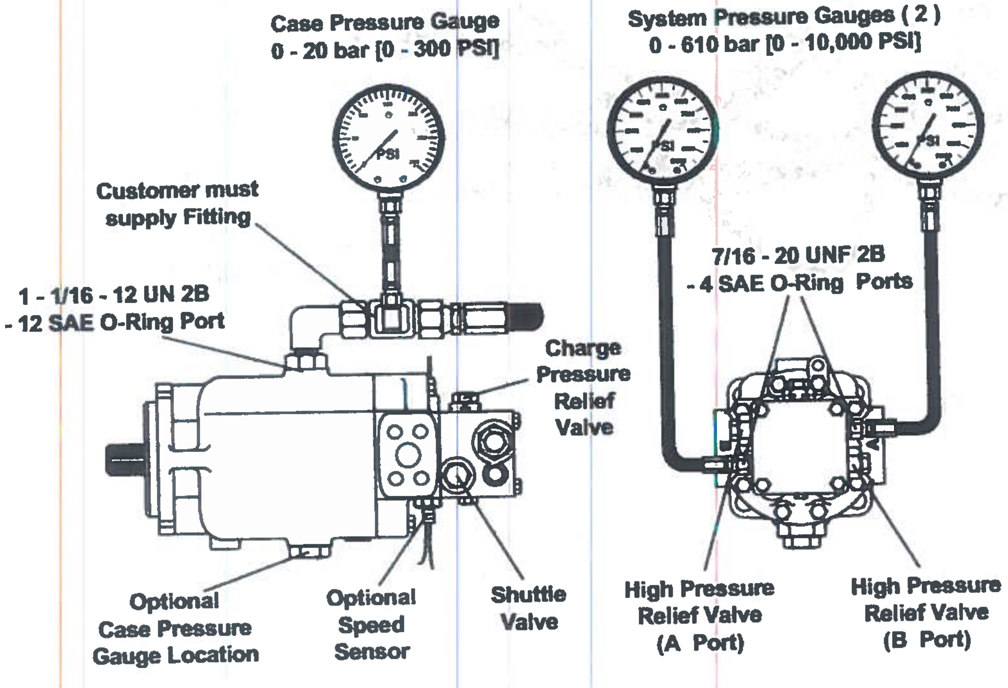
1	Variable Displacement Pump	7	Pump and Motor Case Drain Lines
2	Fixed or Variable Displacement Motor	8	High Pressure Lines
3	Reservoir	9	Heat Exchanger
4	Shut-off Valve (Optional)	10	Heat Exchanger By-pass Valve
5	Filter	11	Reservoir Return Line
6	Charge Pump Inlet Line	12	Reservoir fill Cap and Breather

Gauge Requirements, Gauge Port Size and Locations

Variable Displacement Pumps

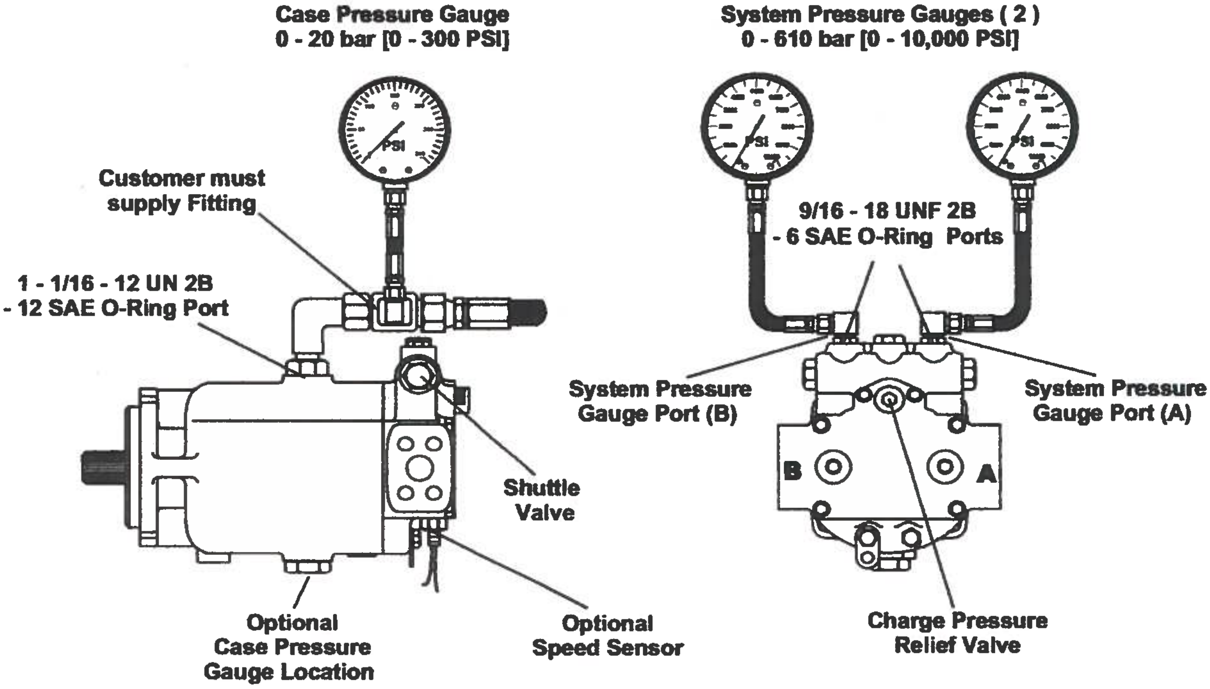


Fixed Displacement Motor



Gauge Requirements, Gauge Port Size and Locations

Fixed Displacement Motors
(with Integral Shuttle)


Case Pressure Gauge
0 - 20 bar [0 - 300 PSI]
System Pressure Gauges (2)
0 - 610 bar [0 - 10,000 PSI]
PSI
Customer must supply Fitting
1 - 1/16 - 12 UN 2B - 12 SAE O-Ring Port
9/16 - 18 UNF 2B - 6 SAE O-Ring Ports
System Pressure Gauge Port (B)
System Pressure Gauge Port (A)
B
A
Shuttle Valve
Optional Case Pressure Gauge Location
Optional Speed Sensor
Charge Pressure Relief Valve

Note: To protect your instrumentation, all gauges should be dampened (or snubbed) and mounted with flexible lines.

Pressure Readings

The pressures given in this manual are gauge pressures or delta pressures. A pressure gauge reads zero when connected to atmospheric pressure. Any reading above or below this zero point is referred to as gauge pressure (bar [PSI]). Delta pressure is the difference of two gauge pressures in a hydraulic circuit.

Example:

Charge pressure reading of 16,5 bar [240 PSI]
- Case pressure reading of 1,5 bar [20 PSI]
Differential pressure of 15,0 Δ bar [220 Δ PSI]

Typical hydrostatic circuits usually include a inlet pressure, case pressure, low or charge pressure and system or high pressure. These pressures will vary per each individual application and operating conditions.

Nominal Operating Pressures

(At Normal Operating Temperature)

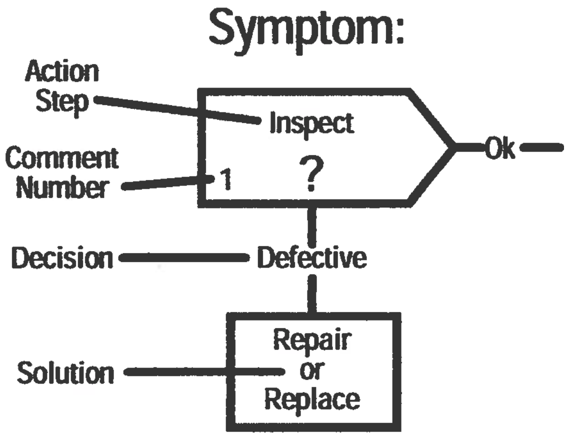
Inlet Vacuum:	Should not exceed 254 mm [10 in.] mercury (Hg.) for an extended period of time	
Case pressure:	Should not exceed 2,8 bar [40 PSI] for an extended period of time	
Charge Pressure:*	Neutral	15,2 Δ bar [220 ΔPSI]
	Forward or Reverse	11,0 Δ bar [160 ΔPSI]

*Charge Pressure Relief valves are factory preset to their nominal setting with a 7,6 l/min [2 GPM] flow rate. The original valve pressure will increase approximately ,45 bar per 3,8 l/min [6.5 PSI per 1 GPM] additional flow over the valve. The charge pressures given above are typical. Higher charge pressures may be set at the factory for your particular application.

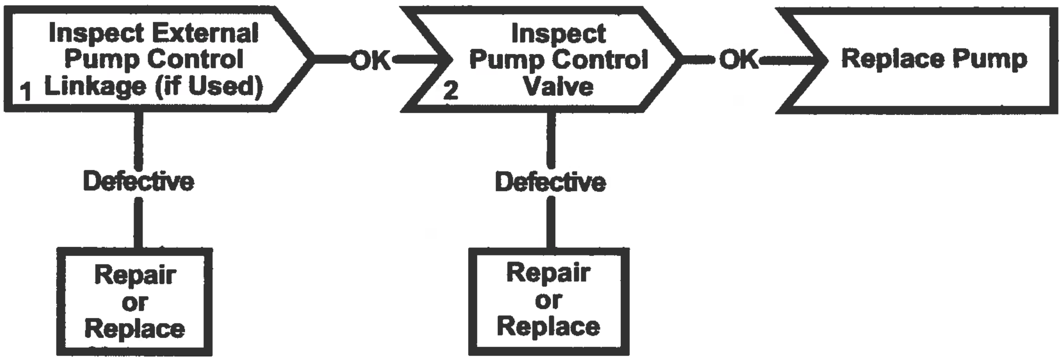
Fault-Logic Troubleshooting

This guide is designed as a diagnostic aid for the user to locate possible transmission problems. Match the transmission symptoms with the problem statements and follow the action steps shown in the box diagrams. This will help in correcting minor problems, eliminating unnecessary mixer down time.

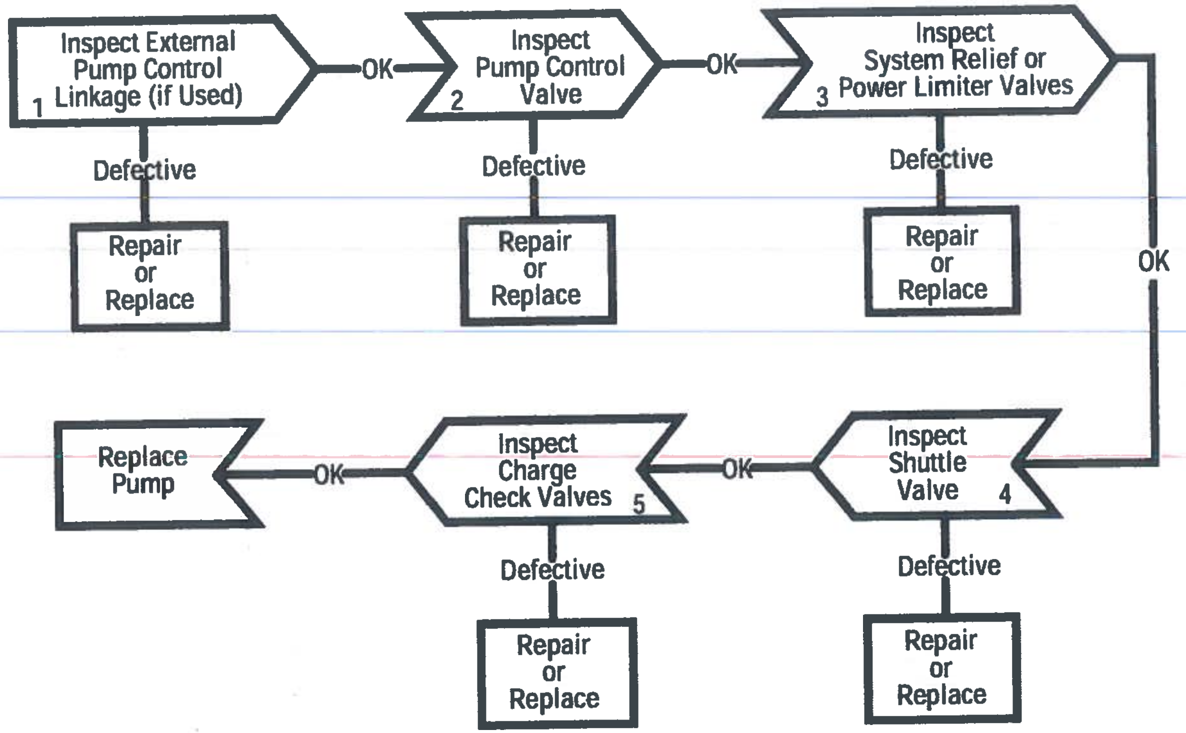
Following the fault-logic diagrams are diagram action comments to further help explain the action steps shown in the diagrams. Where applicable, the action comment number of the statement appears in the action block of the diagram.



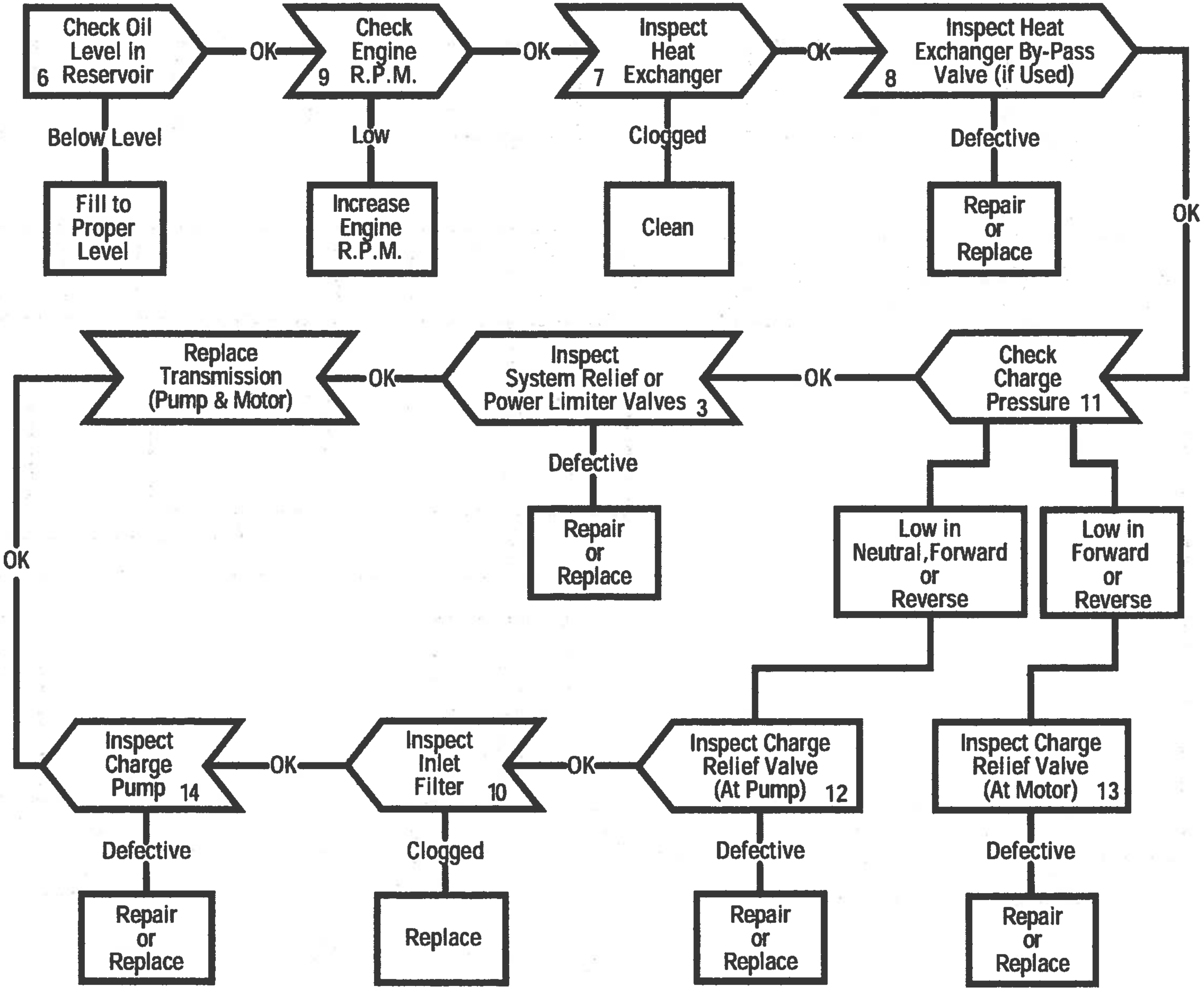
Neutral Difficult or Impossible to Find


Inspect External Pump Control Linkage (if Used)
1
OK
Inspect Pump Control Valve
2
OK
Replace Pump
Defective
Repair or Replace
Defective
Repair or Replace

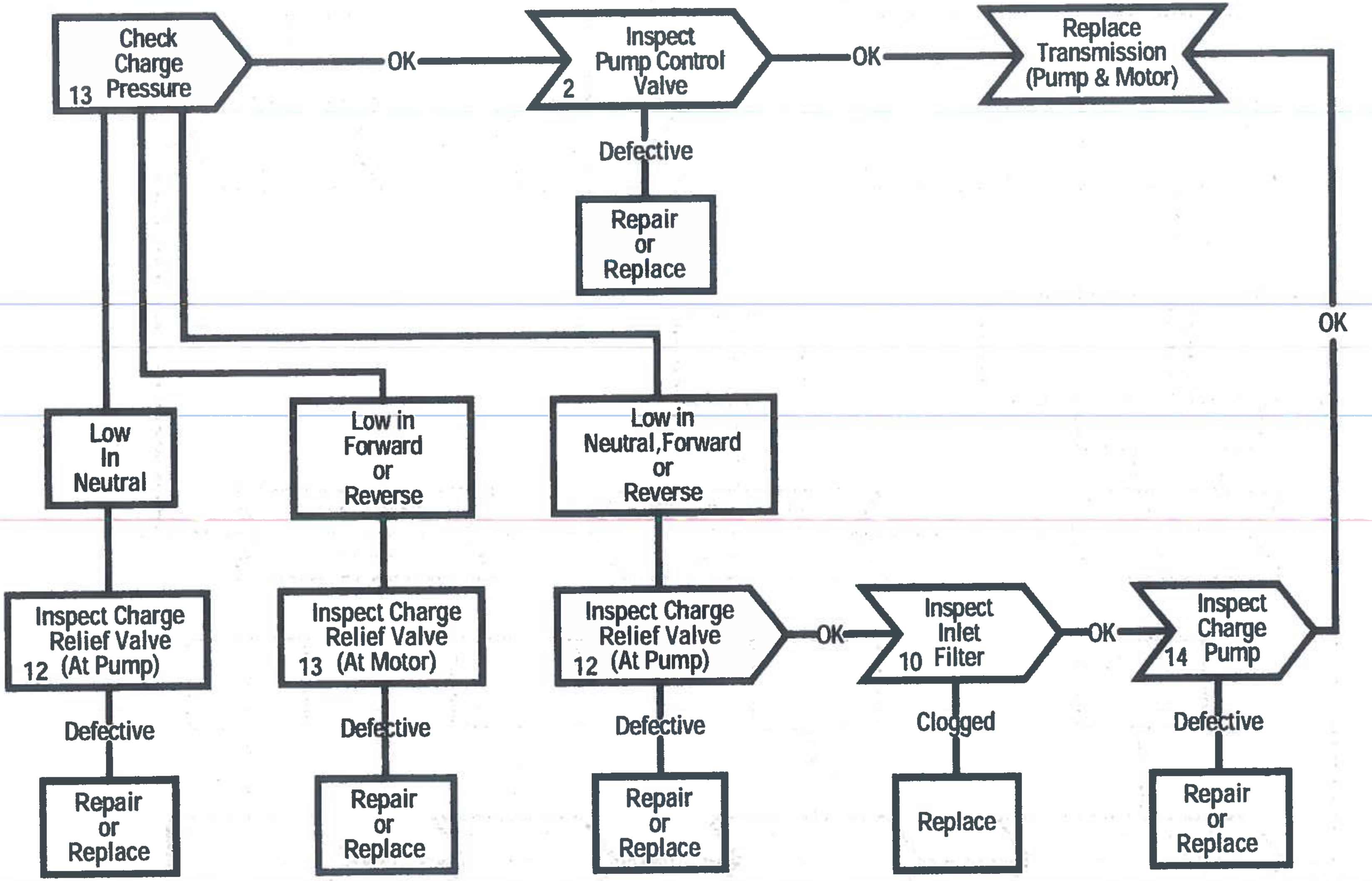
Drum Turns in One Direction Only



Hydraulic System Operating Hot



Drum Response Sluggish



Drum Stalls or Will Not Turn In Either Direction

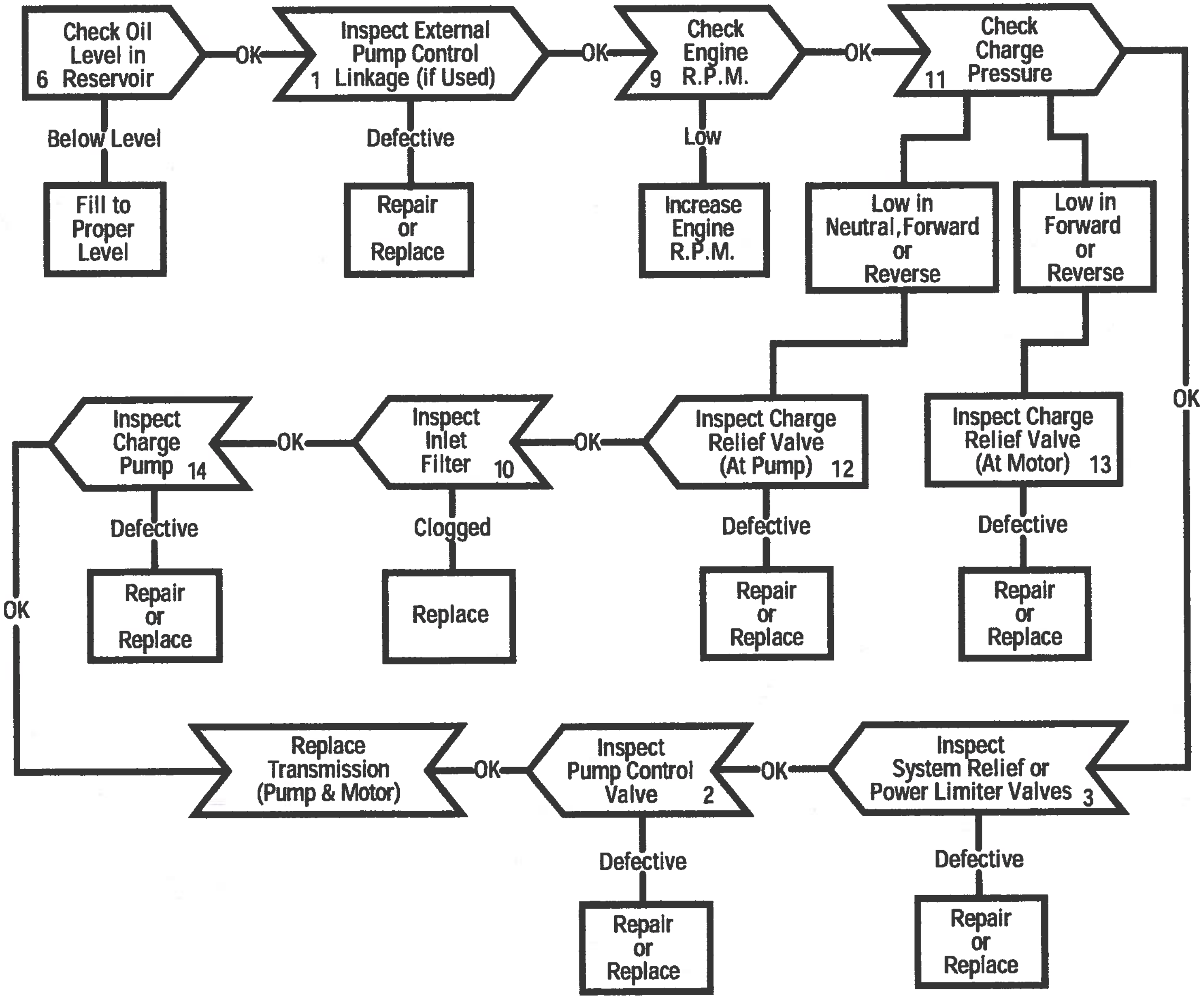


Diagram Action Step Comments

1. Inspect External Pump Control Linkage for:
   (Manual Operated Controls)
   A. Misadjusted or disconnected
   B. Binding, bent or broken

   (Electrical Operated Controls)
   A. Disconnected electrical signal connection

2. Inspect Pump Control Valve for:
   (Manual Operated Controls)
   A. Plugged control orifice
   B. Damaged mounting gasket
   C. Misadjusted, damaged or broken neutral return spring
   D. Broken control connector pin
   E. Broken or missing control linkage pin(s)
   F. Galled, stuck or bent control spool

   (Electrical Operated Controls)
   A. Plugged control orifice
   B. Damaged mounting gasket
   C. Galled, stuck or bent control spool
   D. Stuck solenoid valve(s)
   E. Defective solenoid coil(s)
   F. Misadjusted speed sensor (when used)
   G. Defective speed sensor (when used)
   H. Defective electronics module
   NOTE: When the electronic transit mixer control is used, follow the control box fault dector instructions.

3. Inspect System Relief or Power Limiter Valves for:
   (System Relief Valves)
   A. Improper pressure relief setting (Consult owners/operator manual for system relief valve settings.)
   B. Damaged or missing O-ring and/or back-up ring(s)
   C. Plugged orifice
   D. Piston galled or stuck
   E. Valve poppet held off seat

   (Power Limiter Valves)
   A. Improper pressure relief setting (Consult owners/operator manual for power limiter valve settings.)
   B. Broken spring
   C. Valve held off seat

4. Inspect Shuttle Valve for:
   A. Bent or broken return centering spring
   B. Galled or stuck shuttle spool
   C. Bent or broken shuttle spool

5. Inspect Charge Check Valves for:
   A. Damaged or missing O-ring and/or back-up ring(s)
   B. Damaged check ball seat
   C. Stuck check ball

6. Check Oil Level in Reservoir:
   A. Consult owner/operators manual for the proper type fluid and level.

7. Inspect Heat Exchanger for;
   A. Obstructed air flow (air cooled)
   B. Obstructed water flow (water cooled)
   C. Improper Plumbing (inlet to outlet)
   D. Obstructed or insufficient fluid flow
   E. Cooling fan Failure (if used)

8. Inspect Heat Exchanger By-Pass Valve for:
   A. Improper pressure setting
   B. Stuck or broken valve

9. Check Engine R.P.M.
   A. Consult owner/operators manual for minimum engine rpm.

10. Inspect Inlet Filter for:
   A. Plugged or clogged filter
   B. Obstructed inlet or outlet
   C. Collapsed inlet line to charge pump
   D. Open inlet to charge pump

11.* Check Charge Pressure:
   A. Consult page 4 in this manual for charge pressure gauge installation location.
   B. Consult owner/operators manual for charge relief valve settings.

12.* Inspect Charge Relief Valve for:
   (at Pump)
   A. Improper charge relief pressure setting
   B. Plugged Orifice
   C. Piston galled or stuck open and/or closed
   D. Damaged or missing O-ring
   E. Valve poppet held off seat

13.* Inspect Charge Relief Valve for:
(at Motor)
- A. Improper charge relief pressure setting
- B. Plugged Orifice
- C. Piston galled or stuck open and/or closed
- D. Damaged or missing O-ring
- E. Valve poppet held off seat

14. Inspect Charge Pump for:
(Standard and A-Pad Pumps)
- A. Broken drive tang
- B. Damaged or missing o-ring(s)
- C. Broken drive key
- E. Galled or broken gerotor set

(B-Pad Pumps)
- A. Stripped or broken drive coupling
- B. Stripped or broken drive spline
- C. Damaged or missing o-ring(s)
- D. Broken drive key
- F. Galled or broken gerotor set

Diagram Action Step Comments

*System / Charge Relief Valve Pressure Setting Identification

The system and charge pressure relief valves are all factory preset. For identification, a pressure code is stamped on the hex plug located on the end of the system and charge pressure valve cartridges.

This same code is also used on the power limiter valves. The code number is stamped on the end of the valve cartridge. (Power limiter valves must be removed to view pressure code.) To determine the pressure setting of each valve, add a zero to the right of the stamped coded number.

Charge Pressure Valve Examples
016 = 160 Δ PSI Setting [11,0 Δ bar]
022 = 220 Δ PSI Setting [15,2 Δ bar]

System and Power Limiter Valve Pressure Examples
400 = 4000 Δ PSI Setting [275 Δ bar]
500 = 5000 Δ PSI Setting [345 Δ bar]

Hydraulic Fluid Recommendations

Introduction

The ability of Eaton hydraulic components to provide desired performance and life expectancy depends largely on the fluid used. The purpose of this document is to provide readers with the knowledge required to select the appropriate fluids for use in systems that employ Eaton hydraulic components.

One of the most important characteristic to consider when choosing a fluid to be used in a hydraulic system is viscosity. Viscosity choice is always a compromise; the fluid must be thin enough to flow easily but thick enough to seal and maintain a lubricating film between bearing and sealing surfaces. Viscosity requirements for each of Eaton's product lines are given on the back of this document.

Viscosity and Temperature

Fluid temperature affects viscosity. In general, as the fluid warms it gets thinner and its viscosity decreases. The opposite is true when fluid cools. When choosing a fluid, it is important to consider the start-up and operating temperatures of the hydraulic system . Generally, the fluid is thick when the hydraulic system is started. With movement, the fluid warms to a point where a cooling system begins to operate. From then on, the fluid is maintained at the temperature for which the hydraulic system was designed. In actual applications this sequence varies; hydraulic systems are used in many environments from very cold to very hot. Cooling systems also vary from very elaborate to very simple, so ambient temperature may affect operating temperature. Equipment manufacturers who use Eaton hydraulic components in their products should anticipate temperature in their designs and make the appropriate fluid recommendations to their customers.

Cleanliness

Cleanliness of the fluid in a hydraulic system is extremely important. Eaton recommends that the fluid used in its hydraulic components be maintained at ISO Cleanliness Code 18/13 per SAE J1165. This code allows a maximum of 2500 particles per milliliter greater than 5 µm and a maximum of 80 particles per milliliter greater than 15 µm. When components with different cleanliness requirements are used in the same system, the cleanest standard should be applied. OEM's and distributors who use Eaton hydraulic components in their products should provide for these requirements in their designs. A reputable filter supplier can supply filter information.

Fluid Maintenance

Maintaining correct fluid viscosity and cleanliness level is essential for all hydraulic systems. Since Eaton hydraulic components are used in a wide variety of applications it is impossible for Eaton to publish a fluid maintenance schedule that would cover every situation. Field testing and monitoring are the only ways to get accurate measurements of system cleanliness. OEM's and distributors who use Eaton hydraulic components should test and establish fluid maintenance schedules for their products. These maintenance schedules should be designed to meet the viscosity and cleanliness requirements laid out in this document.

Fluid Selection

Premium grade petroleum based hydraulic fluids will provide the best performance in Eaton hydraulic components. These fluids typically contain additives that are beneficial to hydraulic systems. Eaton recommends fluids that contain anti-wear agents, rust inhibitors, anti-foaming agents, and oxidation inhibitors. Premium grade petroleum based hydraulic fluids carry an ISO VG rating.

SAE grade crankcase oils may be used in systems that employ Eaton hydraulic components, but it should be noted that these oils may not contain all of the recommended additives. This means using crankcase oils may increase fluid maintenance requirements.

Hydraulic fluids that contain V.I. (viscosity index) improvers, sometimes called multi-viscosity oils, may be used in systems that employ Eaton hydraulic components. These V.I. improved fluids are known to "shear-down" with use. This means that their actual viscosity drops below the rated value. Fluid maintenance must be increased if V.I. improved fluids are used. Automotive automatic transmission fluids contain V.I. improvers.

Synthetic fluids may be used in Eaton hydraulic components. A reputable fluid supplier can provide information on synthetic fluids. Review applications that require the use of synthetic fluids with your Eaton representative.

Viscosity Requirements

Product Line	Minimum	Optimum Range	Maximum	ISO Cleanliness Requirements	Comments
Heavy Duty Piston Pumps and Motors	60 SUS [10 cSt]	80 - 180 SUS [16 - 39 cSt]	10,000 SUS [2158 cSt]	18/13	

Additional Notes:

- Fluids too thick to flow in cold weather start-ups will cause pump cavitation and possible damage. Motor cavitation is not a problem during cold start-ups, except for two speed motors. Thick oil can cause high case pressures which in turn can blow motor shaft seals.

- When choosing a hydraulic fluid, all the components in the system must be considered and the optimum viscosity range adjusted accordingly. For example, when a medium duty piston pump is combined with a Geroler motor the optimum viscosity range becomes 100 - 150 SUS [20 - 32 cSt] and viscosity should never fall below 70 SUS [13 cSt].
- If the natural color of the fluid has become black it is possible that an overheating problem exists.

- If the fluid becomes milky, water contamination may be a problem.

- Take fluid level reading when the system is cold.

- Contact your Eaton representative if you have specific questions about the fluid requirements of Eaton hydraulic components.

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Form No. 3-406

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EATON

Eaton®
Medium Duty Piston Pump

No. 2-604
May, 1997

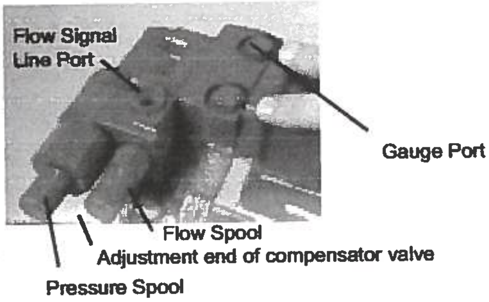
Pressure or Pressure-Flow Compensator Control Adjustment Procedures

This procedure is used to adjust the compensator on the Eaton model 70122, 70422, 70423, and 70523 compensated controlled piston pumps.

Model 70422

Left hand rotation shown

1) Pump model 70122 incorporates two gauge ports. The models 70422 and 70423 may or may not have gauge ports, its an optional feature. The pump model 70523 does not incorporate gauge ports.
Gauge port size is 3/8-24 UNF-2B. One gauge port is to check system pressure and the other to check inlet vacuum. To check system pressure on models without gauge ports a tee fitting must be installed in the pumps outlet port. Always adjust flow spool first and than pressure spool.



To check or readjust flow compensator valve setting:

2) Install pressure gauge into gauge port using a 1/2 inch open end wrench and remove the plug furthest away from adjustment end of the compensator valve. A recommended pressure gauge for checking the flow compensator is 0 to 21 bar or 0 to 41 bar [0 to 300 PSI or 0 to 600 PSI] if the flow compensator pressure exceeds 15 bar [210 PSI]. Use a gauge that is dampened or glycerine filled. With the gauge installed and the load sensing valve in the closed position, start the system and observe the flow compensator pressure. If the reading is other than 13 to 15 bar [190 to 210 PSI], readjustment of the flow compensator may be required.

3) To change setting, remove the adjustment screw cover from the flow compensator valve. Loosen the flow compensator adjustment screw lock nut with a 7/16 inch open end wrench.

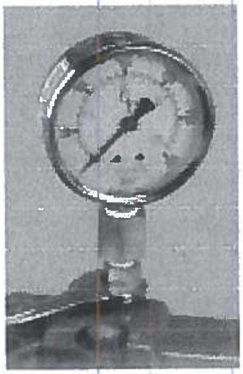
4) With the system running and system control valve in the closed position, use a 1/8 inch Allen wrench to turn the adjustment screw to the proper or desired flow compensated pressure. Clockwise rotation of the adjustment screw will increase the pressure setting and counter-clockwise rotation will decrease the pressure setting. Important: Any readjustments exceeding the 31 bar [450 PSI] maximum factory setting must have prior approval from Eaton Hydraulic Division or the warranty of the pump will be void.

5) After adjustments are complete, hold the adjustment screw stationary and tighten the locknut to (torque 8 to 11 N•m [6 to 8 lbf•ft]).

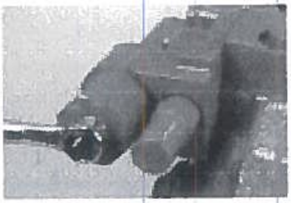
6) After turning system off, install the compensator screw cover and check pressure compensator settings.

To check or readjust pressure compensator valve setting:

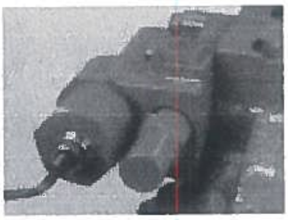
7) Install pressure gauge into gauge port use a 1/2 inch open end wrench and remove the plug furthest away from adjustment end of the compensator valve.



8) Install a pressure gauge into the gauge port. A recommended pressure gauge for checking system pressure is 0 - 670 bar [0 - 10,000 PSI]. The gauge used should also be dampened or glycerine filled. With the gauge installed, actuate the directional control valve so that the discharge of the pump is blocked by the system load, observe the reading on the pressure gauge. If the reading is other than the 207 to 214 bar [3000 to 3100 PSI] maximum factory setting, readjustment of the pressure compensator valve may be necessary. A lower setting for special applications may be possible and permissible.

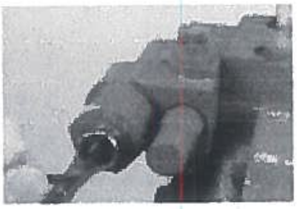


9) To change the compensator setting, you must first use a small screwdriver or similar tool to remove the adjustment screw cover from the pressure compensator cap. Note: The present covers are plastic and if carefully removed may be reused. Prior caps were made of aluminum and in most cases when removed are not reusable.



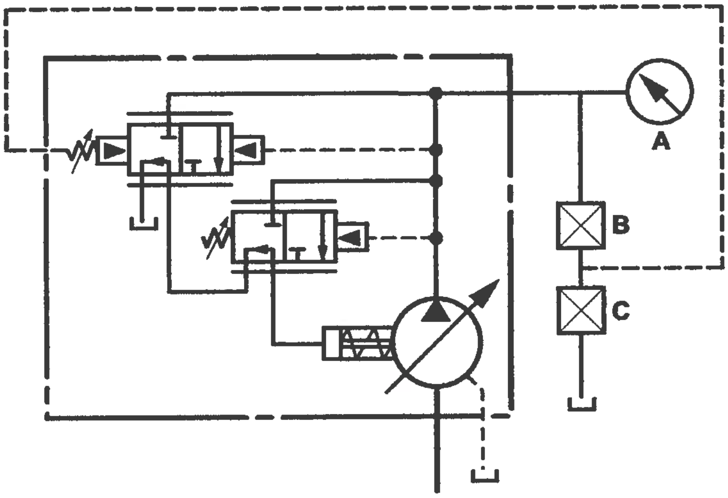
10) To readjust the pressure compensator you must first use a 7/16 inch open end wrench to loosen the compensator adjustment screw lock nut.

11) Next start the pump and actuate the directional control valve so that the discharge of the pump is blocked by the system load. Observe the pressure gauge and use a 1/8 inch Allen wrench and slowly turn the adjustment screw to obtain the desired pressure setting. Clockwise rotation of the adjustment screw will increase the pressure setting and counter-clockwise rotation will decrease the pressure setting. Important: Any readjustments exceeding the 207 to 214 bar [3000 to 3100 PSI] maximum factory setting must have prior approval from Eaton Hydraulic Division or the warranty of the pump will be void.



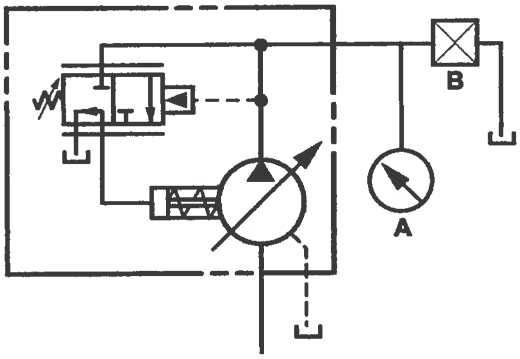
12) After readjustment of the pressure compensator is completed, hold the adjustment screw stationary and tighten the locknut (Torque 8 to 11 N•m [6 to 8 lbf•ft]). Remove the load and install the compensator screw cover. Remove pressure gauge and replace the gauge port (torque 8 to 11 N•m [6 to 8 lbf•ft]).

Test Circuit Set Up for Pressure-Flow Compensators



1) Do not connect the flow signal line to the unit and leave the flow compensator signal port open.
For 1.16, 2.32, and 2.77in^3/r pumps: Block flow from pump using shut - off valve "B" and set flow compensator to produce pressure range specified at point "A".
For 4.21 in^3/r pumps: Set flow compensator for range specified at an output flow of 5-7 gal/min.
2) Connect flow compensator port downstream of shut-off valve "B" with the flow signal line.
3) Open shut-off valve "B". Block flow from pump using shut-off valve "C" which is downstream from the flow signal line. Set pressure compensator to produce a pressure range at point "A" as specified.
Note: For 1.16 in^3/r pumps, and 2.32 in^3/r pumps with non A-pad backplate, add the inlet pressure to the pressure setting tolerance.

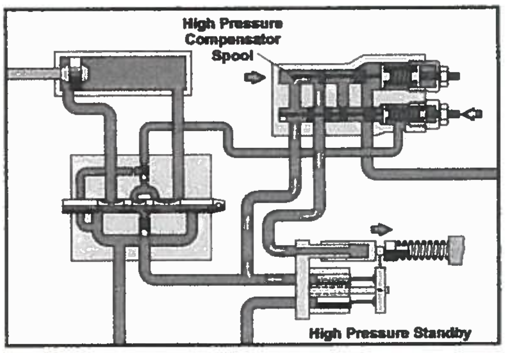
Test Circuit Set Up for Pressure Compensators



1) Block flow from pump using shut-off valve "B". Set pressure compensator to produce a pressure range (at Zero flow).
Note: For 1.16 in3/r pumps, add the inlet pressure to the pressure compensator setting tolerance. For all other units, add the case pressure to the pressure setting tolerance.

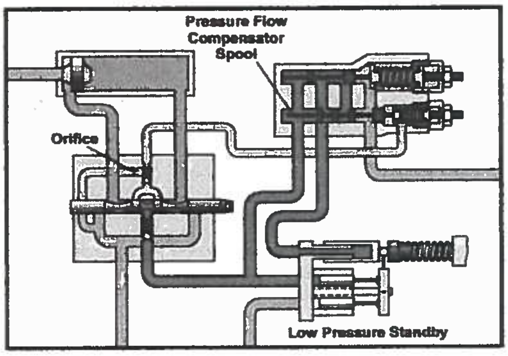
Operation of System

High Pressure Standby



Eventually, the piston in the cylinder (actuator) reaches the end of its travel. When it does, flow past the lands of the directional control spool stops. Pressure equalizes on both sides of the directional control spool and pressure also equalizes on both ends of the pressure-flow compensator spool. The 200 PSI spring forces the pressure flow compensator spool all the way to the left. When pressure reaches 3000 PSI, the high pressure compensator spool moves to the right and directs oil to the camplate control piston. The piston moves the camplate to near zero angle and the pump stops producing flow. This is called the high pressure standby mode.

Low Pressure Standby



Here the spool in the directional control valve has been returned to neutral. The pressure that was directed to the right end of the pressure-flow compensator spool is now drained through the orifice in the control valve. The pump will stroke back to near zero displacement and practically no flow is produced. The 200 PSI acting on the left end of the pressure-flow compensator spool will be offset by the 200 PSI spring acting on the right end of the spool. The spool will modulate back and forth to maintain 200 PSI in the discharge circuit of the pump.

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Test Procedure to Evaluate Fluids in Open Loop Axial Piston Pumps

Technical Data 03-06-0002-EN-0601

Pump Model
PVH57C-RF-2S-11-C25V-31

This test procedure is to evaluate fluids for use in open loop axial piston pumps. It consists of 250 hours of actual test time (not including break-in or performance running). The operation temperature is dependent upon the capability of the test fluid as specified by the fluid manufacturer or the rated temperature specified for the pump, whichever is lower. Inlet fluid temperature must be maintained per fluid/pump rating throughout the complete test.

The pump to be used is a PVH57 with a pressure compensator and load sensing control, model code PVH57C-RF-2S-11-C25V-31.

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Pump Break-In

Pump Break-In

Break in the pump using anti-wear petroleum base hydraulic fluid that complies with Vickers Oil Recommendation Data Sheet M-2950-S. Run the break-in procedure step-by-step as listed in Table 2. Inlet is to be at atmospheric. No external leakage is allowed during the entire test.

Table 2 – Pump Break-In Procedure

STEP	DURATION MIN	SPEED RPM ±20	OUTLET PRESS BAR (PSIG) ±5 (72.5)	INLET OIL TEMP °C ±5 (°F ±9)
1	5	600	50 (725)	Ambient increase
2	5	1200	50 (725)	to ↓
3	10	1200	100 (1450)	
4	10	1200	150 (2175)	
5	10	1800	150 (2175)	
6	10	1800	200 (2900)	
7	10	2400	220 (3190)	95 (203)

Overall Efficiency Percentage

Continue running the pump at full stroke displacement using the parameters in Table 2, Step 7 to determine its overall efficiency.

The outlet flow must be between 121 lpm (32 gpm) and 140 lpm (37 gpm).

If not, STOP THE TEST AND CONTACT YOUR EATON REPRESENTATIVE.

Record the output flow, input torque, and case flow. Compute the overall efficiency using the formulas in Appendix A.

If the overall efficiency is less than 85%, continue running the pump (20 hours maximum) using the parameters in Table 2, Step 7 and re-check overall efficiency using the formulas in Appendix A.

If the overall efficiency is not 85% or greater, DISCONTINUE TESTING AND NOTIFY YOUR EATON REPRESENTATIVE.

Performance Baseline Test

Continue using petroleum-based fluid, but at the conditions listed in Table 1 for the test fluid. Set the compensator at rated pressure; adjust speed and temperature per the ratings for the test fluid.

Perform the pump performance check procedure.

Pump Performance Check

Sequence of Operations

1 Energize 15 while 16 is de-energized. The pump is now at full flow with pump outlet pressure controlled by relief valve 14.
2 Vary pump outlet pressure by adjusting relief valve 14.

Performance Check Procedure

The pump performance check must be at 14 bar (203 psi) below the rated pressure specified in Table 1.

Record the following parameters on the blank Pump Performance Check Record (page 11).

- Input torque
- Output pressure
- Output flow
- Case flow
- Case temperature
- Case pressure
- Inlet temperature
- Inlet pressure

Use the results to compute the overall efficiency per the formulas in Appendix A.

Figure 2 shows an example of test data obtained from the pump performance check.

Figure 2

Company: Petro Oil Company

Date: 19 January 1999

Technician: Joe Technical

Pump Assembly: 690825

Test: Performance

Pump Model: PVH57C-RF-2S-10-C25V-31

Pump Serial No. SC00002

Pump Inlet Fluid Temperature: 120° F

Baseline Performance Check with Petroleum-Based Fluid

Fluid: Western AW Hydraulic Fluid

Pressure:

Speed (rpm): 1750

INPUT TORQUE	OUTPUT PRESSURE	OUTPUT FLOW	CASE FLOW	CASE TEMP	CASE PRESSURE	INLET TEMP	EFFICIENCY
1365 lb.in	2294 psig	25 gpm	.5 gpm	149 F	7 psig	120 F	88%

Pump Break-In

Pump Break-In

Break in the pump using anti-wear petroleum base hydraulic fluid that complies with Vickers Oil Recommendation Data Sheet M-2950-S. Run the break-in procedure step-by-step as listed in Table 2. Inlet is to be at atmospheric. No external leakage is allowed during the entire test.

Table 2 – Pump Break-In Procedure

STEP	DURATION MIN	SPEED RPM ±20	OUTLET PRESS BAR (PSIG) ±5 (72.5)	INLET OIL TEMP °C ±5 (°F ±9)
1	5	600	50 (725)	Ambient increase
2	5	1200	50 (725)	to ↓
3	10	1200	100 (1450)	
4	10	1200	150 (2175)	
5	10	1800	150 (2175)	
6	10	1800	200 (2900)	
7	10	2400	220 (3190)	95 (203)

Overall Efficiency Percentage

Continue running the pump at full stroke displacement using the parameters in Table 2, Step 7 to determine its overall efficiency.

The outlet flow must be between 121 lpm (32 gpm) and 140 lpm (37 gpm).

If not, STOP THE TEST AND CONTACT YOUR EATON REPRESENTATIVE.

Record the output flow, input torque, and case flow. Compute the overall efficiency using the formulas in Appendix A.

If the overall efficiency is less than 85%, continue running the pump (20 hours maximum) using the parameters in Table 2, Step 7 and re-check overall efficiency using the formulas in Appendix A.

If the overall efficiency is not 85% or greater, DISCONTINUE TESTING AND NOTIFY YOUR EATON REPRESENTATIVE.

Performance Baseline Test

Continue using petroleum-based fluid, but at the conditions listed in Table 1 for the test fluid. Set the compensator at rated pressure; adjust speed and temperature per the ratings for the test fluid.

Perform the pump performance check procedure.

Pump Performance Check

Sequence of Operations

1. Energize 15 while 16 is de-energized. The pump is now at full flow with pump outlet pressure controlled by relief valve 14.
2. Vary pump outlet pressure by adjusting relief valve 14.

Performance Check Procedure

The pump performance check must be at 14 bar (203 psi) below the rated pressure specified in Table 1.

Record the following parameters on the blank Pump Performance Check Record (page 11).

- Input torque
- Output pressure
- Output flow
- Case flow
- Case temperature
- Case pressure
- Inlet temperature
- Inlet pressure

Use the results to compute the overall efficiency per the formulas in Appendix A.

Figure 2 shows an example of test data obtained from the pump performance check.

Figure 2

Company: Petro Oil Company

Date: 19 January 1999

Technician: Joe Technical

Pump Assembly: 690825

Test: Performance

Pump Model: PVH57C-RF-2S-10-C25V-31

Pump Serial No. SC00002

Pump Inlet Fluid Temperature: 120° F

Baseline Performance Check with Petroleum-Based Fluid

Fluid: Western AW Hydraulic Fluid

Pressure:

Speed (rpm): 1750

INPUT TORQUE	OUTPUT PRESSURE	OUTPUT FLOW	CASE FLOW	CASE TEMP	CASE PRESSURE	INLET TEMP	EFFICIENCY
1365 lb.in	2294 psig	25 gpm	.5 gpm	149 F	7 psig	120 F	88%

Disassembly and Inspection

Disassemble the pump per Vickers Overhaul Manual M-2210-S, Figure 3. Identify the pistons and respective bores in the cylinder barrel per Figure 4 for re-assembly into the same location.

Figure 3

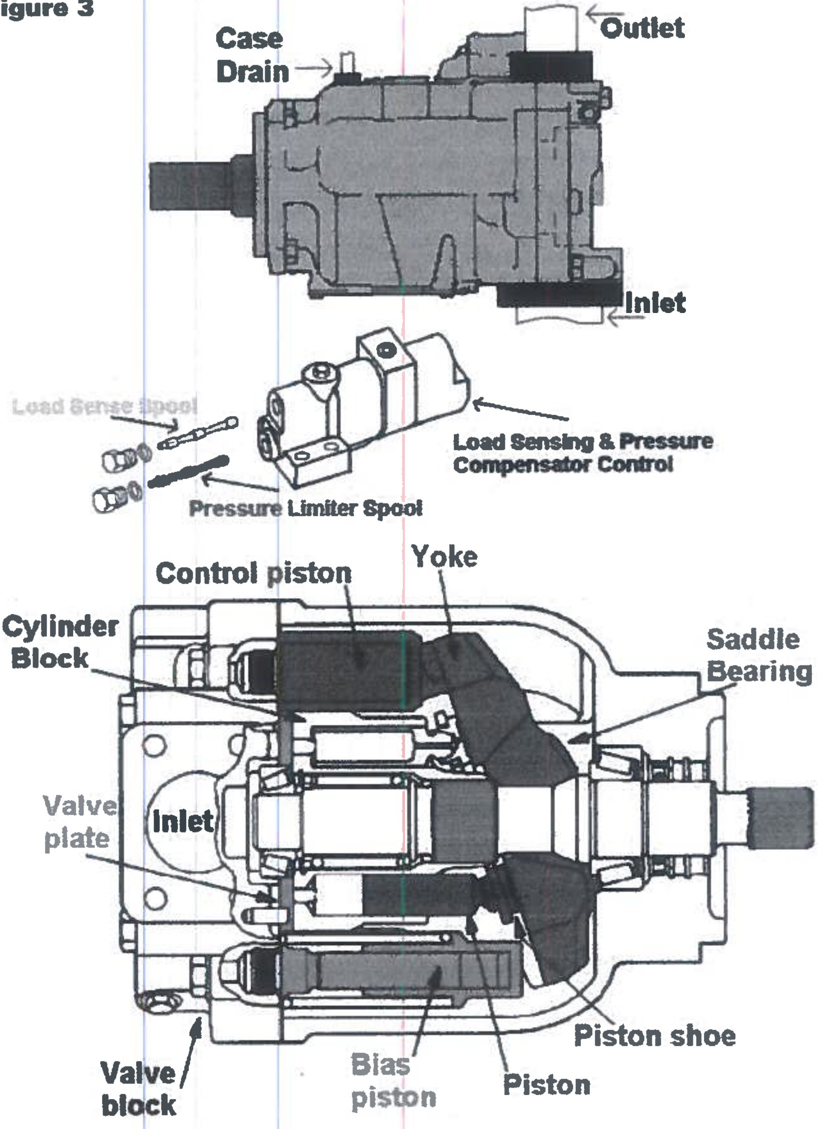
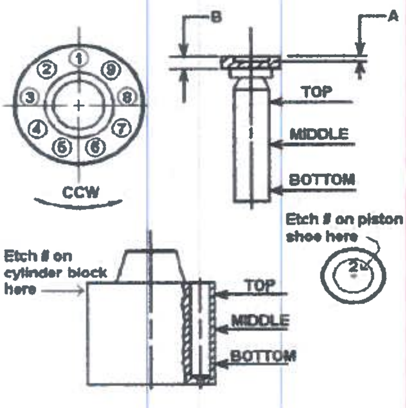


Figure 4



NOTE: In millimeters, measure cylinder barrel bores and piston OD to three decimal places (four decimal places if measuring in inches), and dimensions 'A' and 'B' to two decimal places (three decimal places if measuring in inches).

Record information on a blank Piston/Bore Record (pages 14 and 15).

Disassembly and Inspection (continued)

Inspect its components as follows:

1. Valve plate running-face – inspect surface finish visually and take a photograph. (Figure 5)
2. Cylinder barrel running face – inspect surface finish visually. (Figure 5)
3. Swashplate (yoke) running face – inspect surface finish visually. (Figure 5)
4. Swashplate (yoke) bearing journals – inspect visually. (Figure 5)
5. Cradle (saddle) bearings – inspect visually. (Figure 5)
6. Bias and control piston/rod – inspect visually. (Figure 6)
7. Hold-down arms and shoe face – inspect visually.
8. Shaft and shaft bearings – inspect visually. (Figure 6)
9. Measure metering lands' diameters and widths on both control spools (compensator). (Figure 6)
10. Measure shoe thickness (B), pocket depth (A), piston/shoe endplay (maximum allowable end play 0.13mm [0.005"]), piston diameter at top, middle, and bottom of piston and cylinder barrel bores at top, middle, and bottom. Record results on the blank Piston/Bore Record (page 14).
11. Shoe cage – inspect visually.
12. Shaft seal and mating shaft surface – inspect visually.
13. Photograph visually worn parts.

Figure 5

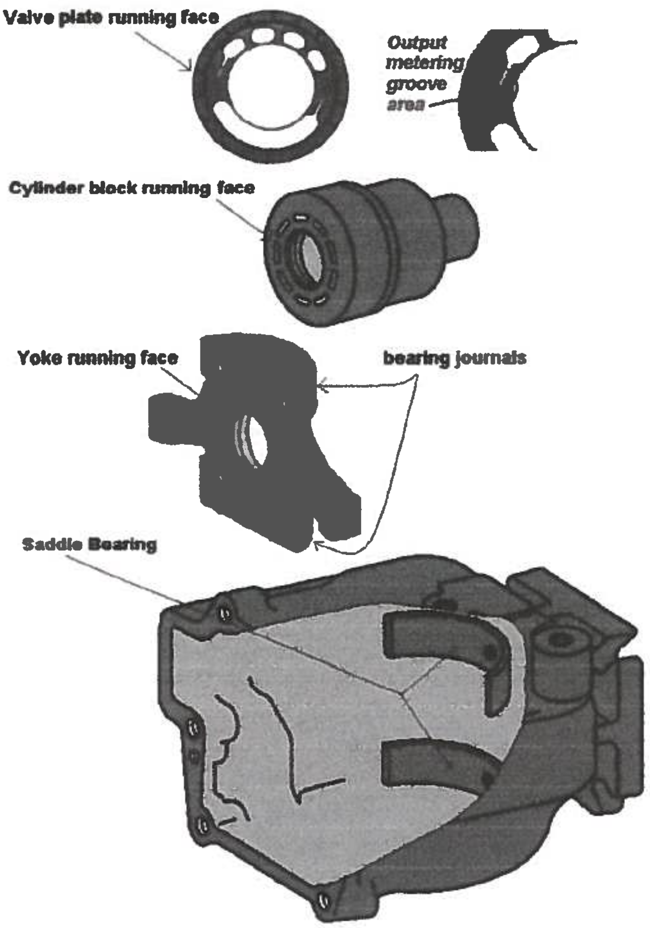
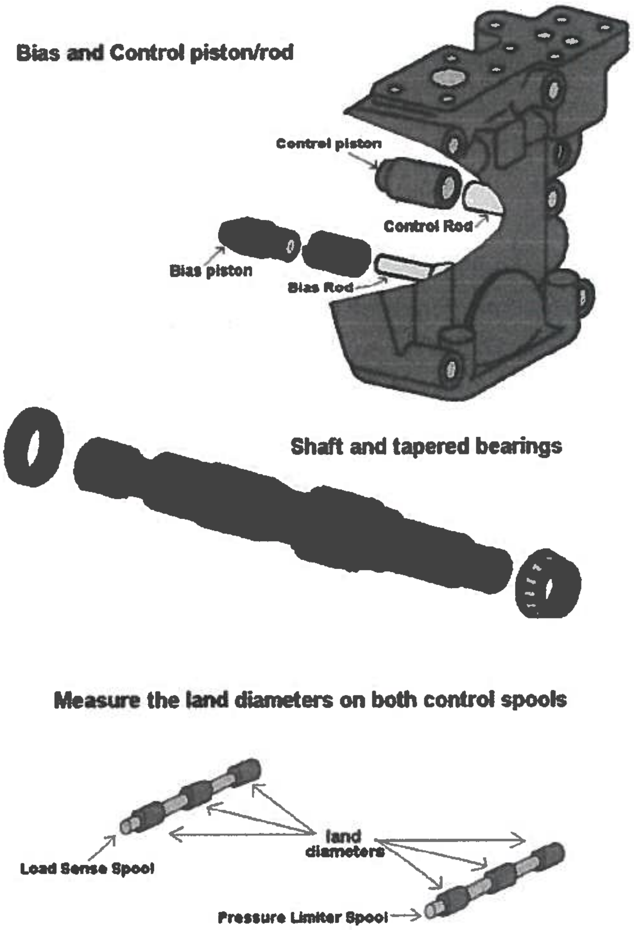


Figure 6


Bias and Control piston/rod
Control piston
Control Rod
Bias piston
Bias Rod
Shaft and tapered bearings
Measure the land diameters on both control spools
land diameters
Load Sense Spool
Pressure Limiter Spool

Appendix B
Control Pressure Hysteresis Test

Sequence of Operations

1 Energize 15 while 16 is de-energized. Pump is now at cut-off (pressure compensation mode, high pressure, no flow).
2 Open variable orifice valve 22 to vary the pump outlet pressure to run a control pressure hysteresis check per Appendix B.
3 Once the control pressure hysteresis check has been completed, close the variable orifice valve 22 and resume test.

Control Pressure Hysteresis Check Procedure

Control pressure hysteresis is calculated using a plot of outlet flow versus control pressure. To check control pressure hysteresis, plot outlet flow (on the y-axis) versus control piston pressure while varying outlet pressure from 500 psi (at full flow) to the compensator setting (high-pressure, no-flow condition) and back to 500 psi (at full flow).

An adapter block needs to be assembled between the control and the end cover (valve block) to pick up control piston pressure. Use a variable orifice valve to vary the pump's outlet pressure (refer to page 3 for preparatory steps). It may take 1.5 to 2.0 minutes to run a sweep from full flow to pressure compensation and back again. The majority of the sweep time should be while the pump is going into and out of the compensator mode.

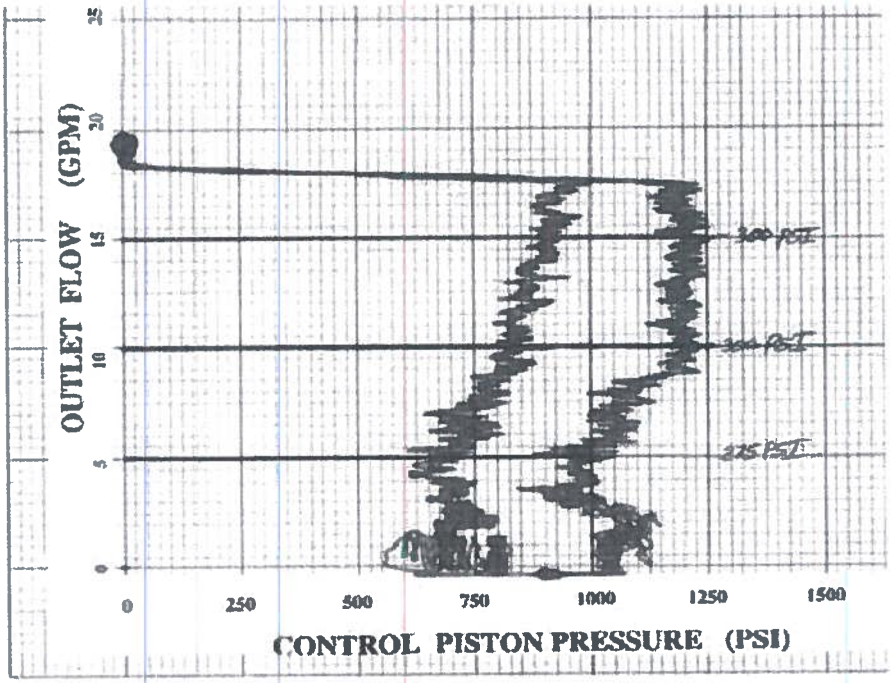
After generating a plot of outlet flow vs. control piston pressure:

- Determine the full flow value.
- Draw horizontal lines on the plot at 75%, 50% and 25% of full flow.
- Determine the pressure values at which these lines intersect the vertical sections of the plot. (Note: There will be two intersection points for each horizontal line.)
- Calculate the difference between each pair of pressure values (one Δp for 75% flow, one Δp for 50% flow, and one Δp for 25% flow).
- Take the average of these three Δp values.

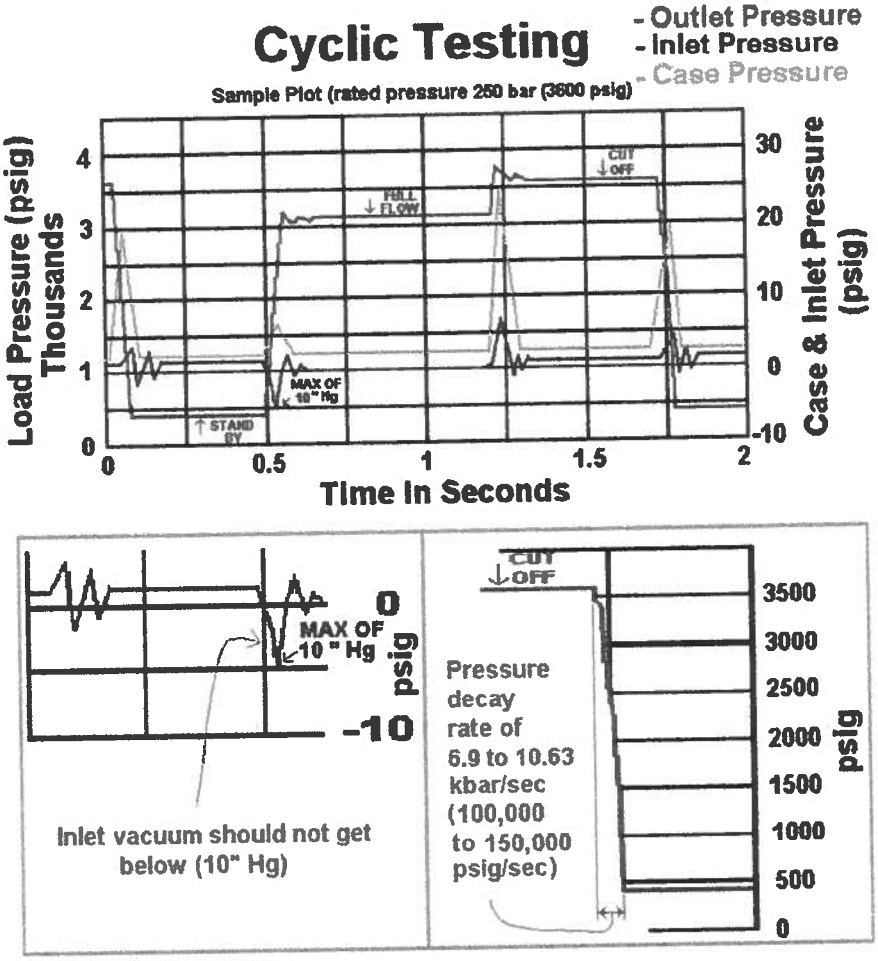
This is considered the average control pressure hysteresis. This value should not exceed 45 bar (652.5 psi).

A sample curve is shown in Figure 8.

Figure 8



Figue 7



Inlet vacuum should not get below (10" Hg)

Pressure decay rate of 6.9 to 10.63 kbar/sec (100,000 to 150,000 psig/sec)

Final Fluid Testing

Measure the following on the test fluid after completion of testing. Record the results on the Test Fluid Record (page 13).

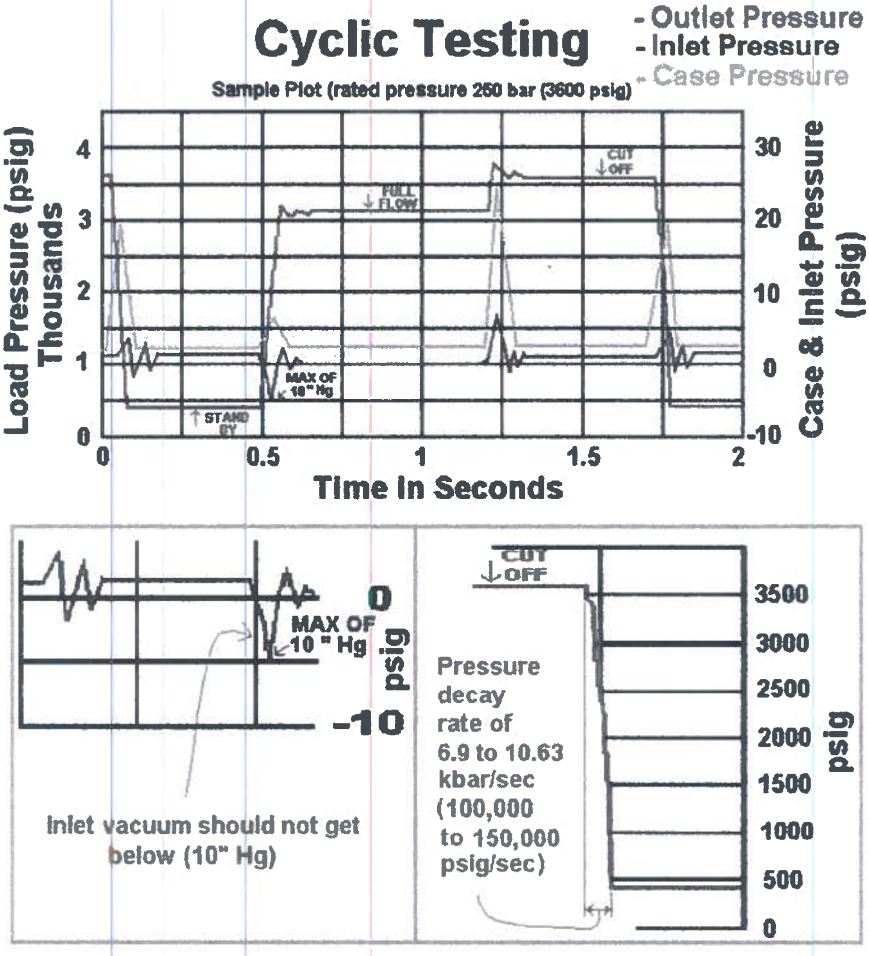
- Viscosity cSt @ 40°C
- Water content wt % (0.03% max. non-water based fluid)
- Cleanliness level ISO Code 18/16/14 or better
- Spectrographic analysis for at least the following elements (ppm): P, Zn, Ca, K, Ba, B, Si, Fe, Cu, Pb, Sn
- Total Acid Number (TAN) mg/KOH (Report only for vegetable and synthetic environmentally acceptable hydraulic fluids, and polyolester fire resistant hydraulic fluids.)

Fluid Pass/Fail Criteria

The following are the criteria by which the fluid is judged to have passed or failed the test:

- The overall efficiency of the pump is equal to or greater than 85%.
- The volumetric efficiency of the pump is not degraded by more than 5% at the end of the 200-hour cyclic test.
- The control pressure hysteresis is less than or equal to 45 bar (652.5 psi) at the end of the 200-hour cyclic test.

Figue 7



Inlet vacuum should not get below (10" Hg)

Pressure decay rate of 6.9 to 10.63 kbar/sec (100,000 to 150,000 psig/sec)

Final Fluid Testing

Measure the following on the test fluid after completion of testing. Record the results on the Test Fluid Record (page 13).

- Viscosity cSt @ 40°C
- Water content wt % (0.03% max. non-water based fluid)
- Cleanliness level ISO Code 18/16/14 or better
- Spectrographic analysis for at least the following elements (ppm): P, Zn, Ca, K, Ba, B, Si, Fe, Cu, Pb, Sn
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- The control pressure hysteresis is less than or equal to 45 bar (652.5 psi) at the end of the 200-hour cyclic test.

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Quality System Certified
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Form No. 03-06-0002-EN-0601
August 2001

Installation Information

No. 4-427
October, 1999

EATON

Heavy Duty Series
Eaton® Pump Controls
990821-000 and 990822-000 Swashplate Feedback Sensor Kit

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Fax 612/937-7130

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Hydraulics Division
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Fax +44(0)1592-773-184

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990821-000 – Feedback Sensor Kit
(3-pin weatherpack shroud connector)

Part No.	Qty.	Description
113334-001	1	Feedback Sensor, Non Contact
95890-150	2	Socket Head Cap Screw 8-32 UNC
92897-008	2	Washer
8761-116	1	O-Ring
101673-025	1	10-24 Socket Button Head Cap Screw
113795-000	1	9/64" Hex Key

990822-000 – Feedback Sensor Kit
(3-pin weatherpack tower connector)

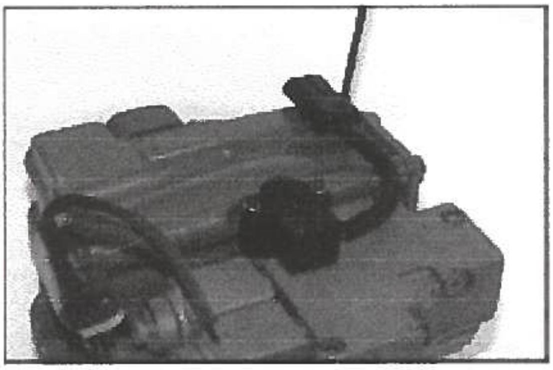
Part No.	Qty.	Description
113334-002	1	Feedback Sensor, Non Contact
95890-150	2	Socket Head Cap Screw 8-32 UNC
92897-008	2	Washer
8761-116	1	O-Ring
113795-000	1	9/64" Hex Key

Equipment Required

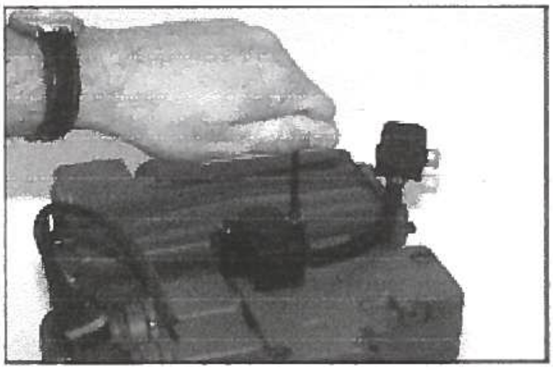
1. Eaton Potentiometer Kit P/N 990821-000 or Kit P/N 990822-000
2. DC Power Supply capable of providing a constant, steady voltage anywhere between 5 and 15 Vdc. One 12V vehicle battery or a 9-volt battery will work if a power supply is not available.
3. Digital Multimeter capable of reading voltage to millivolt precision.
4. Two short jumper cables with banana jack terminations. (see Figure 1-1)
5. Short 3-wire cable; Delphi/Packard termination on one end, banana jack terminations on opposite end. (See Figure 1-2)
6. 9/64" and 1/4" Hex head wrenches.

⚠CAUTION **Make sure the battery is disconnected and the engine or motor providing power to pump is not running. Make sure the parking brake is engaged and other peripheral equipment is disengaged.**

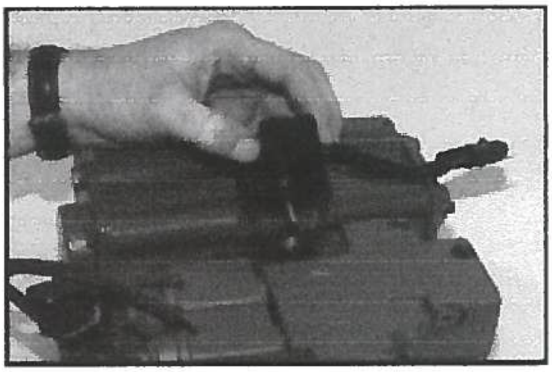
Step 1 – Using a 1/4 hex wrench remove the screw holding the clip to the Feedback Sensor connector as shown.



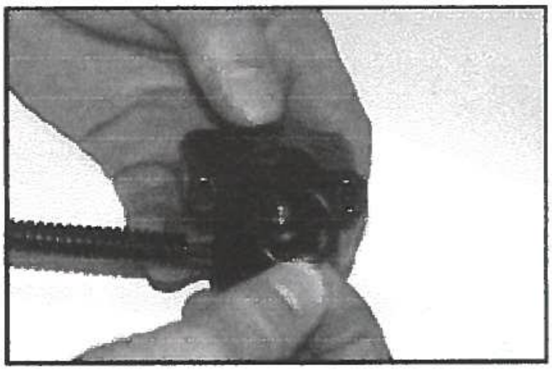
Step 2 – Using a 9/64 hex wrench remove the two screws holding the Feedback Sensor as shown.



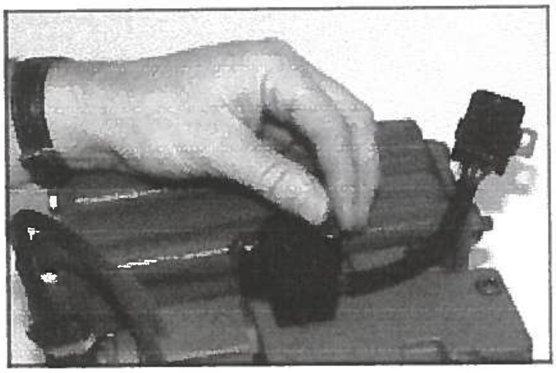
Step 3 – Carefully remove the existing Feedback Sensor and gasket.



Step 4 – Install O-ring into groove on bottom of new feedback sensor.



Step 5
Install the new Feedback Sensor into place with the two cap screws and flat washers as shown. At this point only hand tighten the cap screws.



Step 6 – Set and Check the Supply Voltage

a) Turn the power supply and multimeter on, and allow a brief warm-up period.
b) Connect the equipment as shown in Figure 1-1, below.

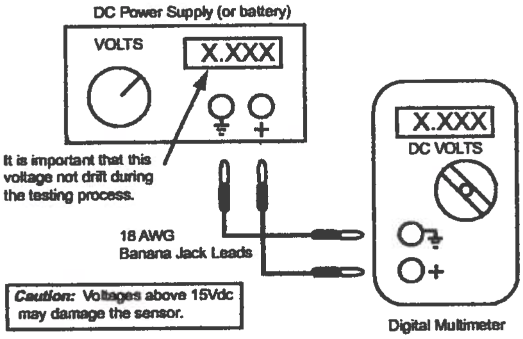

DC Power Supply (or battery)
VOLTS
X.XXX
+
It is important that this voltage not drift during the testing process.
18 AWG Banana Jack Leads
X.XXX
DC VOLTS
+
Caution: Voltages above 15Vdc may damage the sensor.
Digital Multimeter

Figure 1-1

c) Set the multimeter to display DC Volts.
d) Record the power supply output to the nearest millivolt.
e) Do not make any change to the supply voltage from this point on.

Step 7 – Set the Feedback Sensor Neutral

a) Assuming the pump is destroked and in neutral, connect the equipment as shown in Figure 1-2, below.

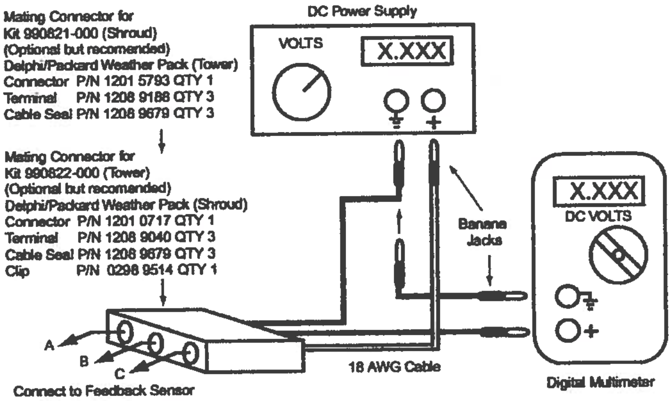

Mating Connector for
Kit 990821-000 (Shroud)
(Optional but recomended)
Delphi/Packard Weather Pack (Tower)
Connector P/N 1201 5793 QTY 1
Terminal P/N 1208 9188 QTY 3
Cable Seal P/N 1208 9679 QTY 3
Mating Connector for
Kit 990822-000 (Tower)
(Optional but recomended)
Delphi/Packard Weather Pack (Shroud)
Connector P/N 1201 0717 QTY 1
Terminal P/N 1208 9040 QTY 3
Cable Seal P/N 1208 9679 QTY 3
Clip P/N 0298 9514 QTY 1
A
B
C
Connect to Feedback Sensor
DC Power Supply
VOLTS
X.XXX
+
Banana Jacks
18 AWG Cable
X.XXX
DC VOLTS
+
Digital Multimeter

Figure 1-2

b) Rotate the sensor housing counterclockwise until the multimeter indicates the sensor's output is exactly half the voltage recorded in step 6d ± X where:

$$X = \frac{\text{Voltage in step 6d}}{480}$$

c) Torque the sensor screws to 26.2 ± 2.6 in-lb. (not ft-lb!) Due to the sensitivity of the sensor, the process of securing it may cause the sensor's output voltage to vary from the desired value.

Note: Precision on "X" in steps 7b & 7d is 3 digits after the decimal point.

d) After the sensor is secured, verify that the sensor's output voltage displayed on the multimeter is still half the voltage recorded in step 6d ± X where:

$$X = \frac{\text{Voltage in step 6d}}{480}$$

This tolerance ensures that the sensor is centered to ± 0.1 degrees about the swashplate's neutral. IT IS VERY IMPORTANT THAT THE SENSOR OUTPUT BE WITHIN TOLERANCE!

e) If the sensor output is out of tolerance, loosen the screws and repeat steps 7b through e.

Step 8 – Reattach the screw holding the clip and connector to the pump. The pump is now ready to return to operation.

Installation
nformation

No. 0 4-621
July 1999

Medium Duty Series
Eaton® Pumps

Kit 70160-901 -01 Design Shimming Process

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Introduction

This shim kit is to add or subtract shims if the camplate, trunnion cover or housing is replaced during servicing. The following procedure is to be used to assure proper preload.

Shimming procedures:

1 Measure the thickness of the existing shims.

2 To obtain a starting point install existing shims.

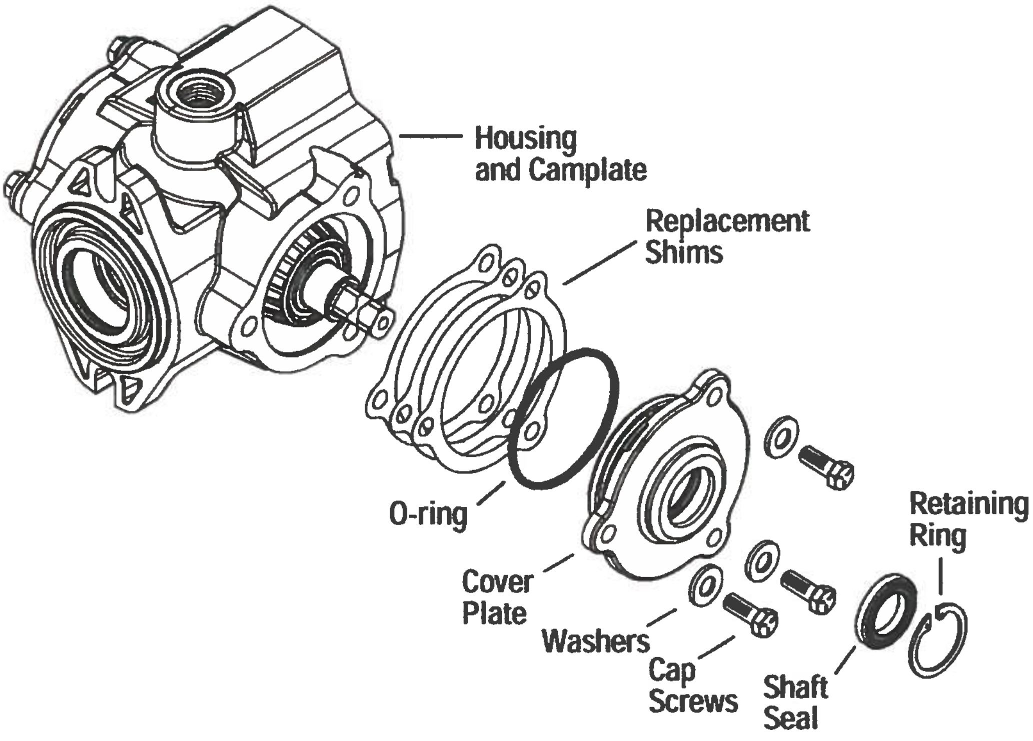
3 Assemble the housing sub-assembly consisting of the housing, camplate, bearings and trunnion covers. Install the trunnion cover bolts and torque to 39.3 N·m [29 lbf·ft].

4 With a torque wrench, check the torque required to rotate the control shaft. The specified torque level is 2,26±0,6 N·m [20±5 lbf·in].

- If torque level is too low, remove shim and repeat steps 3 and 4 until specified torque levels are achieved.

- If torque level is too high, add additional shims and repeat steps 3 and 4 until specified torque levels are achieved.

5 Finish the assembly of the pump.



Installation
nformation

No. 04-622
July 1999

EATON

Medium Duty Series
aton Pumps
Kit 70160-903
-02 Design
Shimming
Process

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Introduction

This shim kit is to replace the crush ring within the trunnion cover. If the camplate, trunnion cover or housing is replaced during servicing, the old crush ring can no longer be used to assure proper preload.

Shimming procedures:

1 Measure the thickness of the existing crush ring.

2 To obtain a starting point stack shims to the measurement of existing crush ring. Then insert shims into the trunnion cover in the same location as the removed crush ring.

3 Assemble the housing sub-assembly consisting of the housing, camplate, bearings and trunnion covers. Install the trunnion cover bolts and torque to 56,9 N·m [42 lbf·ft].

4 With a torque wrench, check the torque required to rotate the control shaft. The specified torque level is 2,26±0,6 N·m [20±5 lbf·in].

- If torque level is too low, add additional shims and repeat steps 3 and 4 until specified torque levels are achieved.

- If torque level is too high, remove shims and repeat steps 2 and 3 until specified torque levels are achieved.

5 Finish the assembly of the pump.